

Finding Order Amid Complex Small-Scale Fisheries Self-Governance Arrangements: A ‘Beyond-Harvesting’ Research Agenda for Common-Pool Resources Theory

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Abstract

An increasing recognition of small-scale fisheries’ contributions to food security, poverty alleviation, and sustainable livelihoods has yielded calls to target funding and policy interventions to this common-pool resource. However, without a more comprehensive theory of small-scale fisheries governance, it is unlikely that these efforts will produce the intended outcomes. In this paper, we offer conceptual and theoretical developments to guide research and practice on small-scale fisheries governance. Small-scale fisheries are complex systems that take place largely outside of the reach of State authority and are organized around interlinked pre-harvesting, harvesting, and post-harvesting activities. To better account for these characteristics, we expand existing conceptual tools from institutional analysis and common-pool resource theory. First, we propose a new institutional level, the micro-institutional level, that captures how individual behavioral patterns shape self-organization. Then, we describe a basic set of linked action situations common to all small-scale fisheries that capture the connections among pre-harvesting, harvesting and post-harvesting decisions. We illustrate the utility of these theoretical advancements with an empirical investigation of self-governing fisher-fish buyer relationships in Mexican small-scale fisheries. Using interviews and two longitudinal datasets on loan and repayment interactions between fishers and fish buyers, we demonstrate the role that trustworthiness and transaction costs play in the emergence of stable groups working together to obtain capital, harvest fish, and commercialize product. These micro-institutional patterns function as precursors to fisheries governance institutions. This analytical approach contributes more broadly to common-pool resource theory and institutional analysis of the commons by linking micro-situational accounts of individual decisions and behavior, traditionally studied in the lab and through experiments, with design-based perspectives on institutional emergence and change. Furthermore, it drives a ‘beyond harvesting’ approach that acknowledges that actors’ decisions around resource governance are often driven by the way they self-organize to obtain capital and participate in markets. Ultimately, the conceptual and theoretical advancements that this analysis illustrates help scholars and practitioners cut through the confounding diversity and complexity of small-scale fisheries to design more appropriate research and policy interventions.

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Introduction

It is estimated that small-scale fisheries account for over 90 percent of the world's commercial fishers, and when processors and other persons employed along the value chain are included they sum over 108 million people (FAO, 2014). In this estimation, roughly half are employed in the ocean and the other half in inland fisheries, making small-scale fisheries far and away the ocean's largest employer (greater than oil and gas, shipping, tourism, etc.) (World Bank et al. 2012). This level of activity translates into a large portion of the global fish catch: an estimated 46 percent of the total, and 38 percent of the fish caught in the ocean (World Bank et al. 2012). While reliable global estimates of the contributions of small-scale fisheries to food security, poverty alleviation, and resource sustainability are harder to come by, there is increasing consensus that they are larger than previously acknowledged (Jentoft et al. 2017).

We also see a dramatic increase in scholarly and practitioners' interest in small-scale fisheries in the last two decades. Measured as numbers of scientific publications overtime using SSFs as a topical keyword, we see about 150 papers in the late 1990s to about 2,108 in the 2000s (Smith in prep., Basurto et al. 2017). The level of funding and practitioners' involvement on small-scale fishers' issues—currently encompassing a wide variety of topics and approaches—also highlights an unprecedented level of attention (Basurto et al. 2017).

Governance stands as one of the main challenges for fishers' ability to secure their livelihoods, ensure food security, and strive for better resource management around small-scale fisheries (Basurto et al. 2017). Yet, identifying the main governance challenges, let alone what are the most appropriate institutional arrangements to achieve a diversity of desirable societal and environmental outcomes, remains much less clear. For instance, a deductive discourse analysis of the literature shows that in the 1960s-1980s the main governance problem was described as a problem of “under-exploitation” or a missed opportunity to secure food and income. In the 1960-1980s, it was articulated as a problem of “over-exploitation” of the resources, and in the 1980-2000s in terms of “conflict over the value and use of resources” (Smith et al. in prep).

In addition to the confounding issues of the social construction of ‘what the problem of governance is,’ and its temporal dimension, there are also challenges originated from the sheer diversity of organizational forms and activities encompassed by small-scale fisheries worldwide. Indicative of such diversity is the agreement among scholars and practitioners that a universal definition of ‘small-scale fisheries’ is neither possible nor useful (Béné 2006). Instead, scholars point to some of their varying characteristics: their dynamism, labor and gender roles in different pre-harvesting, harvesting, and post-harvesting activities in marine or inland waters, labor intensity (e.g., full, partial time, or just seasonal) and movement (resident or migratory), and the different administrative and managerial strategies to organize production such as self-employment or as part of a cooperative among others (FAO, 2003). Given the diversity of activities described above, it is reasonable to ask, how can one make headway in building a science and art of association, to paraphrase Tocqueville (Allen 2005), that is appropriately suited for the context of small-scale fishing? Is it possible to find commonalities and order among the complex governance arrangements we see? Or is SSFs just a broad term encompassing a myriad of different forms of production in aquatic environments intersecting a number of sectors and challenges (e.g., fishing, food security, poverty, forestry, aquaculture, etc.) that need to be considered separately, particularly for systematic policy analysis?

We argue it is possible to find order within small-scale fisheries' diverse governance arrangements but we lack a theory about self-governance of common-pool resources (CPRs) that incorporates understanding of how actors organize their day-to-day livelihood activities beyond harvesting, such as the decisions made during pre-and post-harvesting activities.

The goal of this paper is to offer initial steps towards conceptual and theory development that better capture how decisions made pre-harvesting, harvesting, and post-harvesting all influence each other. A 'beyond-harvesting' conceptualization of CPRs could better acknowledge that decisions around harvesting practices are influenced by how fishers organize to gain access to capital, labor, and commercialization, key aspects of CPR governance. Theoretically, we propose to take a 'horizontal' and 'vertical' approach to extend analysis 'beyond harvesting.' More concretely, through a 'vertical' approach we propose to add the concept of 'micro-institutions' to Ostrom's notion of levels of analysis, and through a 'horizontal' approach we propose to further develop the concept of 'chains of action situations' or 'networks of action situations' proposed in the past (McGinnis, 2011). This conceptual expansion primes analyses to view SSFs as diverse sets of actors with different interests and power who are connected through a variety of institutions (Agrawal and Gibson, 1999). We illustrate these issues in the context of small-scale fishing. This line of inquiry can contribute to improve our ability to ask better questions about why CPR users in general, and SSFs in particular, organize and operate the way they do, which in turn could offer critical answers for those interested in making contributions to SSFs policy-making grounded in practices of self-governance.

The remainder of the paper is organized as follows. In the following section, we describe our approach to enhancing the theory underpinning small-scale fisheries research and practice. We explicate our proposal to expand our conceptualization of SSFs governance institutions in two directions: downward to account for the micro-institutions driving individual behavioral choices and patterns and outward to highlight the linkages between fisheries harvesting institutions and pre- and post-harvesting activities. Next, we ground our discussion of vertical and horizontal expansion in the Mexican SSFs context, with particular attention to two forms of self-governance: fishing cooperatives and patron-client relationships. We then present an empirical investigation of the micro-institutions underpinning the organization of these self-governing groups in small-scale fisheries in Mexico as they undertake pre-harvesting activities. We conclude with a discussion of our findings that explores their implications for governance of small-scale fisheries more broadly.

Theoretical Background and Approach

To better address the challenge of finding ways to structure policy analysis of complex small-scale fishing governance arrangements we propose two different conceptual devices anchored on institutional analysis and the Institutional and Analysis Development (IAD) Framework. The IAD Framework provides a structure for analyzing institutional arrangements in which the action situation constitutes a focal unit of analysis, and is defined as the situation where "two or more individuals are faced with a set of potential actions that jointly produce outcomes" (Ostrom 2005, 32).

The first conceptual proposition is to add a layer, we call 'micro-institutions,' to Ostrom's well established notion of levels of analysis (Ostrom, 2005). We argue this theoretical device adds

information about the motivations individuals find to come together to transact with each other about fishing. The ‘micro-institutional’ layer provides information about the informal contractual arrangements underpinning group formation and thus influencing the structure of operational and collective-action rules and activities. We argue the notion of ‘micro-institutions’ is particularly useful for contexts like small-scale fisheries, which most often operate outside of legally binding contractual arrangements and have not received as much theoretical attention as other types of CPRs.

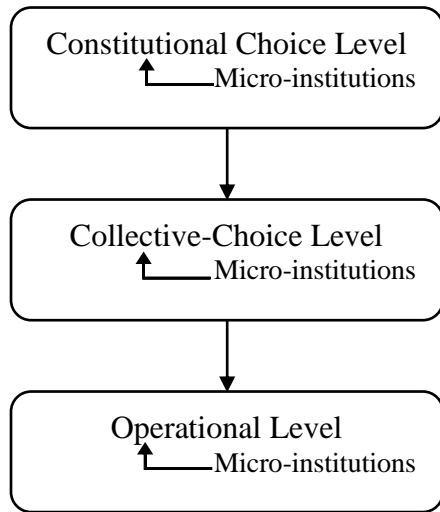
The second conceptual device is aimed at identifying a core set of linked action situations characteristic of commercial small-scale fishing. Conceptualizing small-scale fisheries as composed by an array of linked action situations also offers the possibility to move away from powerful imaginaries hegemonic in fisheries. For instance, the hegemonic imaginary of ‘fisheries as harvesting.’ This imaginary obscures considerations of activities and decisions that take place before and after harvesting, that are inherently important in understanding how harvesting takes place (Smith et al. in prep). Another imaginary that can be challenged is that of fisheries as ‘a sector.’ Considering how multiple action situations are linked to harvesting helps disarticulate ‘sector’ as an analytical and policy analysis unit. Furthermore, horizontal linkages that show how the activities of obtaining capital inputs, commercializing catch, and distributing profits influence resource harvesting decisions also link SSFs as part of broader political economic context and provides greater clarity of their role and resistance within capitalist and neoliberal hegemonies. Finally, this approach allows us to move away from the powerful imaginary of ‘fisheries as hopelessly chaotic, disorganized, and in the need of external reorganization.’

Expanding Vertically: Adding the concept of ‘micro-institutions’ to Ostrom’s levels of analysis

To expand vertically we add another element to Ostroms' concepts of different levels of analysis (Ostrom, 1986). Back in the 1980s Vincent and Elinor Ostrom offered three distinct levels as lenses under which collective action could be analyzed: the operational, collective-choice, and constitutional levels of analysis (Ostrom, 1986). The operational level constituted the daily decision-making processes that allowed for harvesting and commercialization activities to take place; the collective-choice level represented the arenas in which decision-making processes that determined operational rules took place; and the constitutional level represented decision-making arenas for the design collective-choice processes. Each different level has different characteristics and in any particular policy system any number of operational, collective-choice or constitutional arenas may be present. This frame acknowledges that institutions are human artifacts amenable to intervention and change to achievement of diverse outcomes.

We define *micro-institutions* as the processes characterized by individual behavioral factors that become salient when individuals interact with each other, like trust and reciprocity, and thus affect the emergence of relatively stable groups over time and thus, the structure and performance of collective activities at operational, collective choice, or constitutional choice levels (Figure 1).

Figure 1. Micro-institutions and their relationship with levels of analysis following Ostrom (1986).



Our aim to incorporate *micro-institutions* to Ostrom's levels of analysis follows Poteete et al.'s (2010) call for the need to develop theory at the 'micro-situational level or context', which refers to the micro-level factors or information individuals use to evaluate the situation in which they are in and determine if it is safe for them to establish trust-based relationships. Despite Poteete et al. (2010) calls to incorporate micro-institutional factors into broader level field studies it is our evaluation that there has not been much movement in the literature in that regard. Here we illustrate this idea in the context of fishing to make explicit the role of how different dimensions of trust influence how individuals come to associate themselves and in turn build their operational or collective-choice level interactions.

Explicit consideration of the role of micro-institutional factors also offers the potential to bring into conversation two strands of collective action theorists. The first emphasize self-organizational aspects of the formation and change of institutional arrangements. Under this approach the explanatory basis of change occurs as a result of individuals making decisions about particular transactions (Axelrod, 1986; Hodgson & Knudsen, 2004a). Of particular interest are transactions in which actors' decisions jointly affect each other's outcomes, positively or negatively. If the parties of a transaction manage to interact in a way that is mutually beneficial, they may interact repeatedly using the same strategies. If one or both actors lose out, they may change their strategy or seek different partners. Eventually, stable interactions and expectations may emerge that constitute institutions such as rules, conventions, social norms, or equilibria. A variety of decentralized processes such as learning and imitation (Henrich & Gil-White, 2001), power relations and bargaining (Safarzyńska & van den Bergh, 2010), and communication and sanctioning (Bicchieri, 2002; Kandori, 1992) can influence which institutions stabilize and how they spread.

Even though this perspective focuses on individuals and their transactions, the concept of groups is essential. In the most basic sense, group boundaries are necessary in order for individuals to develop stable expectations about who shares institutions and who does not. Further, compliance with certain institutions can be reinforced through exclusion from a group. Finally, institutional

formation and change often occurs at the group level. For example, in evolutionary accounts, the institutions structuring individual interactions within a group influences group-level fitness with regard to competition with other groups or vis-à-vis the natural environment (Boyd et al., 2003; Henrich, 2004; Kallis & Norgaard, 2010). Similarly, in the context of economics, institutions within firms may persist or disappear depending on how they influence the firm's success (or failure) in the market (Hodgson & Knudsen, 2004b).

The second strand has emphasized understanding the determinants of successful collective action for purposes of policy analysis of common-pool resources, particularly forests, fishers, pastures, and water. A key assertion in common-pool resource theory is that, under favorable circumstances, resource users can engage in collective action to modify the operational rules that influence sustainability of resource use (Acheson, 1988; Berkes, 1986; McKean, 1982, 1986; Ostrom, 1990; Tang, 1992; Wade, 1988). Two of the most recognized contributions to the field of self-governance have been the identification of factors that increase the likelihood resource users will successfully engage in collective action and design principles associated with long-enduring self-governance systems (Agrawal, 2001; Cox et al., 2010; Ostrom, 1990). This approach aims to understand the linkages between particular institutional arrangements and outcomes, and what distinguishes it from the first approach is its' focus on explicit design rather than decentralized emergence of self-governance.

Although it is recognized that both of the above perspectives provide complementary understandings of self-governance, less empirical work has been devoted to their integration outside of modelling and laboratory environments to understand the diversity of institutional responses to social and environmental change. Our 'vertical approach' seeks to bridge both perspectives through field-based identification of micro-institutional behavioral factors that influence the endogenous emergence of relatively stable groups and their performance in operational and collective-action arenas.

Expanding Horizontally: Viewing small-scale fisheries as self-governance arrangements in chains of action situations

An action situation is a core unit of analysis within the IAD framework and an analytically bounded time-space continuum where individuals (acting on their own or as agents of organizations) observe information, select actions, engage in patterns of interaction, and realize outcomes from their interaction (Ostrom, 2005). From this perspective, all action situations can be described using a common set of variables. Ostrom (2005, 32) describes them as the set of participants, the positions to be filled by participants, the potential outcomes, the control that an individual has in regard to this function, the information available to participants about actions and outcomes and their linkages, and the costs and benefits assigned to actions and outcomes.

Using this conceptual lens one can view small-scale fisheries as composed of a number of linked action situations (McGinnis, 2011) that can be categorized broadly as pre-harvesting, harvesting, and post-harvesting action situations. Because these linked action situations overwhelmingly take place outside of the influence of the State or other centrally-dominated policy processes, we characterize SSFs as constituted of chains of self-governing action situations. This tends to be the case either because SSFs operate in weak regulatory settings where the State is 'too far away' to monitor or enforce formal regulations, or because of the formal latitude fishers have been

given by higher-level authorities to craft institutional arrangements (e.g., market and commercialization) with other actors (e.g., processors or middle-men) without meddling by the State (Clark, 2017).

In Figure 2 we present a basic chain of action situations common in commercial SSFs that any experienced student of fisheries will be familiar with regardless of the particular self-organizational arrangement taken by fishers or the contextual setting in which they may be embedded. This is a circular representation only in the sense of the chronological order in which the different action situations take place during a ‘typical’ fishing cycle or event. Yet, like in other common-pool resources, fishers are confronted on a daily basis with chains of action situations linked to each other in complex and non-linear ways and make mental calculations and learning about how their behavior in one action situation will affect outcomes in the others.

A complete analysis of all action situations in commercial SSF would require book-length treatment. Here we only discuss the action situation where actors negotiate access to capital, physical fishing means of production, and property-rights (Figure 2), as an example to illustrate the crucial role micro-institutional factors have in establishing relationships between fishers and fish buyers and the resulting structures of operational and collective-choice arenas.

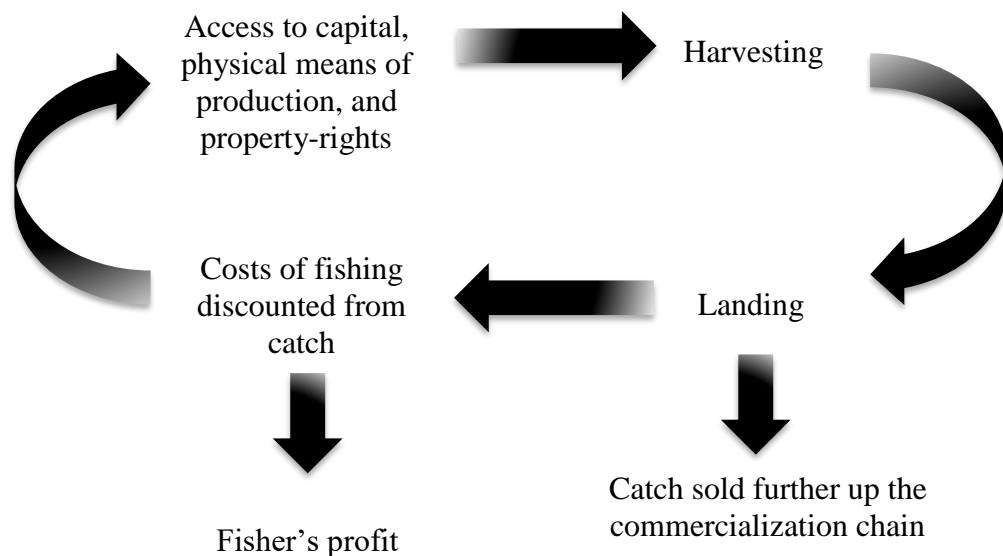


Figure 2. Basic chain of action situations in operational level commercial small-scale fisheries.

As in other common-pool resource settings there is a variety of ways in which resource users can access capital, physical means of production, and fishing property rights. In the simplest possible configuration, a fisher owns his own boat and gear and harvests fish for household consumption or local sale. In SSFs, it is less and less common for a fisher to be in control of all inputs needed for fishing. The most common arrangement in commercial SSFs, is to access these inputs from a capitalist, often the fish buyer to whom fishers sell their catch. In Mexico for instance, the fish

buyer is typically either a fishing cooperative or an individual entrepreneur. If fishers are organized as a fishing cooperative, property rights and capital are usually owned collectively and are accessible only to members. If, however, fishers are working on their own through verbal short-term contracts with a fish buyer (i.e. a patron-client relationship), fishers often need to access capital to pay for short-term expenses (i.e., gas and food for the fishing trip) or pay rent for the use of the boat and fishing gear. Despite differences in ownership structure, cooperatives and patron-client arrangements are similar in that fishers receive capital, property rights, and inputs for fishing from a corporate agent, which binds them to land their catch with that same entity as a way to pay back for the received inputs. In contexts where there is under provision of basic formal legal, political, and economic resources needed for commercial fishing to take place these two forms of self-governance are common (Basurto et al. 2017). Patron-client relationships and cooperatives are often the main pathways for low-income individuals to secure their livelihoods through gaining access to capital to afford the upfront costs of fishing trips (e.g. gas, bait, and food), fishing means of production (e.g., boat, motor, or fishing gear), property rights to the fishery (e.g., fishing permits), as well as to cash for personal loans (e.g., food, school or health emergencies).

Dominant types of self-organized fishing groups: Learning from the Mexican Context

While much of the day-to-day activities of SSFs take place largely outside of the reach of formal State authority, national and international political economic processes have nonetheless shaped the contemporary context within which small-scale fishers navigate livelihoods. Over time, States as well as international organizations have promoted different modes for distributing fishing property rights, capital, and commercialization with a variety of implications for how individual fishers engage self-governance arrangements at the local level.

In Mexico, where our empirical illustration takes place, a long and continuing history of cooperatives and collectivism across economic sectors coupled with recent transitions away from State interventionism toward private sector investment has given rise to a context in which fishing cooperatives and patron-client relationships coexist and compete for labor, market power, and fisheries resources (Bennett, 2017). Early fisheries development in Mexico focused on the promotion of social interests and equitable distribution of resources (Soberanes Fernandez, 1994; Espinoza-Tenorio et al., 2011; Ibarra Mendivil, 1996). In this regard, cooperatives were a key tool for organizing fishing labor, vying for partisan loyalty of rural populations, commercializing fish production, and distributing subsidies, infrastructure, and capital, as Mexico sought to ramp up fisheries production and modernize its fleet. During this period, cooperatives also enjoyed preferential access to valuable fisheries resources, codified in fisheries law (Hernandez and Kempton, 2003).

Beginning in the late 1980s, State support for fishing cooperatives subsided, a symptom of a broader shift toward financial deregulation and decentralization driven in part by the debt crisis and foreign debt servicing obligations. This period saw reduced subsidies to fishing cooperatives and the dissolution of the parastatal firm marketing fisheries products and the state fisheries development bank (Hernandez and Kempton, 2003). The formal legal framework shifted concurrently. Amendments in 1992 to Mexico's constitution made inshore resources available for private sector fishing permits through competitive bidding processes (Torres-Lara, 2000) and the 1994 fisheries law eliminated cooperatives' exclusive access to some valuable species

(Hernandez and Kempton, 2003). These changes opened up opportunities for individuals and private firms to play a more prominent role in the control of capital and property rights in fisheries as well as the commercialization and marketing of fisheries products.

These broader legal and political shifts have produced a context in which both fishing cooperatives and patron-client relationships coexist and often compete for labor, economic power, and access to fisheries resources. We define a fishing cooperative as “an autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise,” (ICA, 2010). Therefore, the provision of capital, financial resources, and property rights occurs through collective action among the members and these resources take the form of club goods (Bennett, 2017). Fishing cooperatives or similar associations are ubiquitous examples of cooperative self-governance. In Mexico, officials estimate the existence of more than 3200 cooperatives (Juárez-Torres et al., 2007), in Turkey, one in every four fishers belongs to a cooperative (Unal et al., 2009) and more than 620 fisher’s syndicates are reported in Chile (Marín et al., 2012).

In contrast, in patron-client relationships capital, financial resources, and property rights belong to a patron. Fishers do not organize collectively for commercialization (Wang, 1999). Instead, fishers craft informal agreements with the patrons to obtain inputs and commercialize their catch (Merlijn, 1989). These informal arrangements can underpin the global seafood trade of certain species. For instance, the mahi mahi fishery of Peru and Ecuador, two of the most important producers in the world, is mostly small scale and based on informal, unwritten, trust-based contracts between fishers and fish buyers. With nearly 60% of their catch exported to the US, its estimated worth was 232 million US dollars in 2012 (NOAA, 2013). Differently from cooperative arrangements, patron-client relationships do not suffer the upfront transaction costs of collective action. It is the patron who provides the fishing inputs and decision-making. Johnson (2010 p. 265) describes this form of self-governance as “common economic arrangements...that link powerful individuals with numerous subordinates. In exchange [for] favors, including loans, protection, or intermediation, patrons receive labor, goods, political support or other benefits.”

To summarize, while the up-front transaction costs of organizing for the provision of inputs for fishing differs between patron-client relationships and cooperatives, they are similar in that a corporate agent provides the fisher with the fishing inputs in return for the obligation to land catch through that agent and thus, assure the repayment of fishing inputs. Given that SSFs mostly operate in a context of highly incomplete and difficult-to-enforce contracts, the likelihood of repayment is directly related to the quality of the relationship the agent has with the fishers. To understand how cooperatives and patron-client relationships form such arrangements, we argue it is necessary to incorporate a micro-institutional context.

The influence of micro-institutions in group formation

Micro-institutions result from the criteria used by fishers and fish buyers to choose with whom to associate themselves to conduct the business of fishing. In the action situation of negotiating the terms of access to capital, fishing means of production, etc., the capitalist agent expects that in return for the provision of these inputs the fisher will land his catch to the agent at an agreed-upon price and the upfront loan will be discounted from the fisher’s profit. Given that these are

informal verbal contracts, each time a fish buyer makes a loan or rents a fisher his fishing permit or fishing gear, he is taking a risk that the fisher will fail to meet his obligation to land catch from which the loan and rent are paid. A fisher can land his catch elsewhere in order to avoid repaying the loan or rent without facing (legal) consequences besides those resulting from direct fish buyer action. In the long run, however, meeting obligations may be of interest to a fisher who wishes to continue to have access to loans, capital, gear, and fishing permits through subsequent transactions. Thus, we are interested in understanding the micro-institutional conventions that underpin the decisions of fishers and fish buyers to associate together given the dynamics of loan provision and repayment.

Transaction costs also influence the type of self-governance arrangement fishers will choose to organize their operational activities (Basurto et al., 2013) and interact with micro-institutions in doing so. For instance, transaction costs are especially high in contexts where opportunism can flourish, for example when individuals do not have easy access to formal legal means of enforcement (Gabre-Madhin, 2001; Williamson, 2000) such as SSFs. Given the temptation fishers sometimes face to land their catch (partially or totally) to alternative buyers offering higher prices. Fish buyers face strong incentives to identify and associate with fishers they can trust in order to increase the likelihood to attain a steady supply of fish and return on investment. With this in mind, our empirical study illustrates the role of micro-institutions on the formation of fisher-fish buyer groups in the context of patron-client structures and fishing cooperatives. Given the institutional diversity within these two forms of self-governance, our empirical approach examines a patron-client structure where the patron has significantly more capital than fishers and he is in control of fishing property-rights, means of production and access to the market. The type of cooperative we analyze is one that is able to keep basic record-keeping about catches and lending to its members and holds regular assemblies to make collective decisions.

Methods

To study the role of micro-institutions in the formation of fisher-fish buyer groups, we took two complementary approaches: First, we investigated how fish buyers selected the fishers with whom to transact by conducting in-depth interviews with fish buyers. Second, we assembled two longitudinal databases related to the provision of loans by fish buyers and the reciprocating behavior of fishers. Each of the databases comprises data on interactions between a corporate agent (i.e., fish-buyer or cooperative) and numerous fishers.

Interviews with fish buyers to understand how they choose fishers with whom to interact

We asked fish buyers how they choose the fishers with whom to work. We designed and pre-tested our interviews with a key informant fish buyer. We then used a snowball sample approach to contact all fish buyers in the village, some of whom we already knew. Most of the interviews were conducted at the interviewees' homes.

We interviewed all six major fish buyers for one of the key species (pen shells) harvested in an important small-scale fishing community in the Gulf of California (Kino Bay), Mexico between May 23 and June 17, 2011 and followed up with interviews with key informants on February 2nd of 2014. Kino Bay has a population of around 6,000 people, most of whom are dependent directly or indirectly on fishing, and it is estimated there are around 200 boats harvesting 66 species of fish and shellfish throughout the year (Cinti et al., 2010).

Assembling longitudinal quantitative databases for fisher-fish buyer transaction

The patron-client database

We gained access to lending/payment log books belonging to one of the most important fish buyers operating in Kino Bay in terms of the value and volume of landings (25-50% of the total landings in the community). Data encompassed a non-continuous period of roughly five years (April 24, 2003 to February 25, 2009). These log books generally documented transactions on: what species was bought, on what day, from whom, and how much money he loaned out for that particular fishing trip. Log books were hand-written and data recorded in a non-systematic fashion. It took over a period of six months to stitch together six notebooks and digitalize all records. The fish buyer informant clarified any remaining questions related to his note taking quirks. Monetary data amounts about loans and payments for catch was not included due to reliability issues. We could reliably and systematically identify the date, name of each fisher working for the fish buyer, whether a loan was made to him on a particular day, and whether a catch was brought back. With these data, we accounted for the number of repeated interactions with each fisher, and the balance between loans and catches brought back by each fisher. Thus, a transaction was defined as the act of providing a loan by the fish buyer and subsequently receiving catch (or not) from the fisher.

Once logbooks were digitalized and data was plotted (as in Figure 3), we met with the fish buyer informant to discuss data interpretation on April 2012. This process reassured us the data provided an accurate representation of the micro-institutions he had developed with fishers during that time period.

The fishing cooperative database

We gained access to the financial records for a fishing cooperative known for keeping adequate accounting and with whom one of the authors had developed a working relationship. This cooperative operates in the Yucatan Peninsula and the data obtained mirror that of the previously described database for a continuous five-year time period from 2009 to 2013.

Results

First, we highlight interview data that allowed us to identify the criteria fish buyers use to determine the fishers with whom they transact. Then, we present the longitudinal dataset representing transactions between fishers and fish buyers over time.

Fish buyers prefer to work with reliable, skilled, and trustworthy fishers

In interviews fish buyers reported seeking to work with fishers with one, some, or all of the following characteristics: 1) Fishers who go fishing on a predictable basis when the weather is good, as opposed to not going out (e.g. because of substance abuse or ill-maintained equipment). 2) Fishers who are capable of landing adequate catch because they have the knowledge and skills to do so, and 3) loyal fishers who uphold agreements to land their catch with the fish buyer who provided loans and inputs instead of with another fish buyer offering a better price.

Fish buyers' success is partly a function of their ability to identify and develop trustworthy relationships with highly reliable and loyal fishers and to minimize interactions in which fishers behave opportunistically. One fish buyer stated that "most fishers engage in non-trustworthy behavior 20 percent of the time and even more frequently in times of resource abundance!"

Lending money to fishers who fail to bring back catch at all, at the right time, or in sufficient volume such that the buyers can fulfill commitments with other clients further up the supply chain can lead to the failure of their business. Fish buyers seek a core group of reliable fishers that can provide a constant supply of fish.

Fish buyer interviewees stated that once they have identified a loyal and reliable fisher who does what he says he is going to do and brings fish in a reliable way, they will continue to work with this person as long as they can. Cooperatives also prefer members with a reputation of trustworthiness and positive behavior and often put prospective new members on probation before formally accepting them into the organization. A fish buyer informant characterized a reliable fisher as “someone that does not ask you for [a lot of] money, goes to work, and brings you a lot of fish.” Another fish buyer stated that reliable fishers are “responsible, hardworking, come through with their commitments, and learn my working system.” Yet another highlighted that “there are fishers that ask you for work and if one sees they are not responsible you do not lend them for gas, they better go ask someone else, it doesn’t matter that they go with another buyer...because they are not responsible, they are too much trouble, they are more of a problem than the benefits you get from their catch.”

Micro-institutions and group formation: Trustworthiness in fisher-fish buyer transactions

Based on the above findings, the micro-institutions influencing the formation of groups between fishers and a fish buyer are based around trust and reciprocal interactions related to fishing inputs. While the interviews provided qualitative data on the stated importance of reliability and trustworthiness in how fish buyers chose fishers with whom to work. The two longitudinal loan-catch transactions datasets allow us to analyze how levels of trustworthiness between individuals relate to repeated interactions over time and thus the stability of such groups.

We operationalized trustworthiness as fisher’s consistency of loan repayment. For the patron-client relationship, we analyzed the number of times a fisher sold catch to a fish buyer relative to the number of loans that same fish buyer provided to the fisher. For the cooperative, we analyzed the number of times a fisher made a payment on a loan relative to the number of times he took a loan from the cooperative. This slight difference in the operationalization of trustworthiness for each fish reflects differences in how patron-client relationships and cooperatives operate and the data available from each. However, both approaches capture the fish buyers’ notions of reliability in landing catch and paying back loans. In the discussion section, we address the implications for drawing comparisons between the two forms of self-governance.

Figures 3 and 4 plot patron-client and cooperative’s data respectively. For both figures, the heat color indicates the number of fishers at a given data point. The x-axis represents the number of loans given by the fish buyer to each fisher. In Figure 3, the y-axis represents the number of times each fisher landed catch with the fish buyer. In Figure 4, the y-axis represents the number of times each fisher made a payment toward a loan. The 45-degree diagonal represents where the number of loans made by the fish buyer equals the number of times that the fish buyer received catch (or a loan payment) from that fisher.

Figure 3. Loan-catch transactions in a patron-client relationship

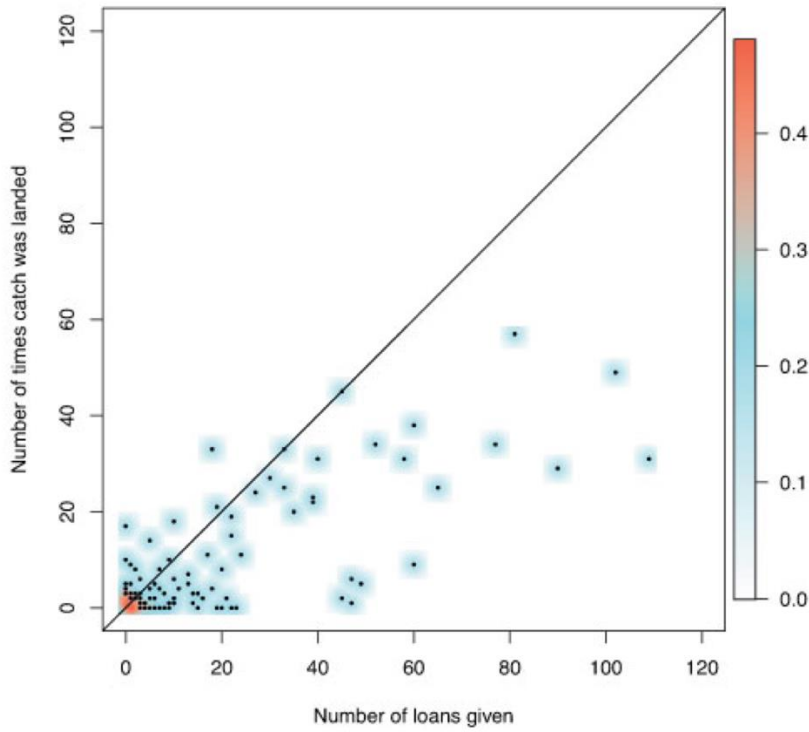


Figure 4. Loan-catch transactions in a cooperative

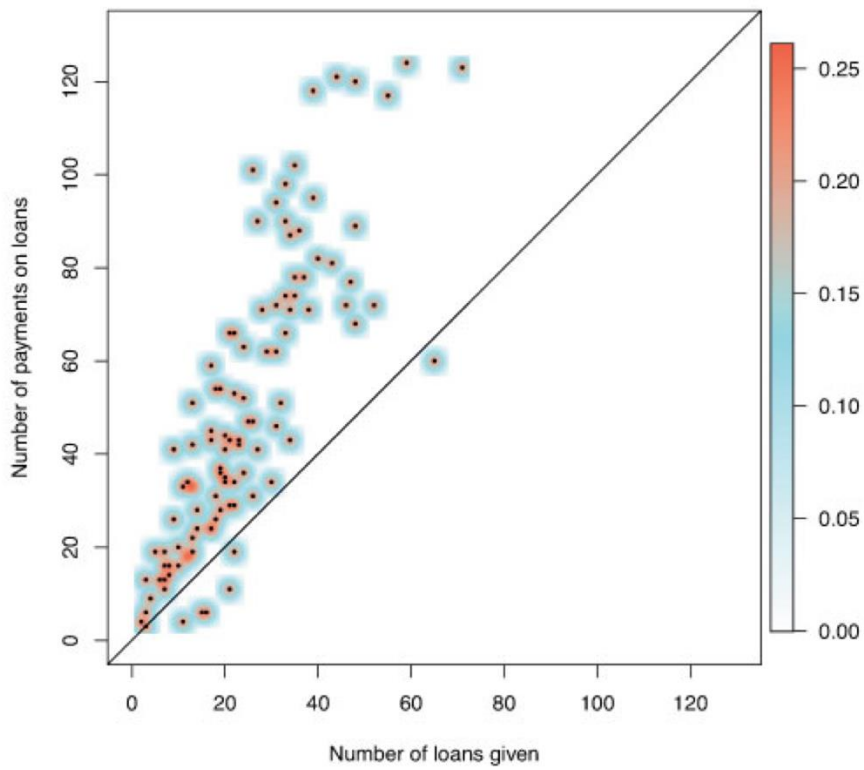


Figure 3 shows that most fishers working for the patron displayed non-trustworthy behavior overall (about 80 in the five-year period). However, the number of interactions the fish buyer had with the most non-trustworthy fishers were low. Most interactions took place with trustworthy fishers, but the number of those fishers was relatively low. There were also a number of fishers who sold catch to the buyer without taking a loan (price-seeking), although, like the non-trustworthy fishers, the number of interactions was low.

Figure 4 shows a different pattern. In the cooperative, the number of interactions for each fisher (loans given and loan payments) is much higher. Non-trustworthy behavior is also substantially less frequent. In fact, almost all fishers made loan payments with greater frequency than the number of loans they received. In the next section, we discuss what these observations may indicate about the micro-institutions driving fisher-fish buyer groups and the apparent differences in distribution of benefits between a patron-client and cooperative group.

Discussion

The motivation for this paper emerges from the challenge of finding ways to structure policy analysis of the complex and diverse governance arrangements present within SSFs characterized by irregular or weak State influence and thus, fertile action arenas for the emergence of local CPR self-governance. Different types of self-governance arrangements offer different benefits and transaction costs to participants. We argue the conceptual device of *micro-institutions*, helps make amenable to analysis such benefits (and costs) by linking understandings of the formation of diads or groups and their incomplete contractual arrangements at the micro-institutional level to operational and collective-choice-level action situations (Figure 1). For instance, our empirical study's interview responses identified trust and reliability as important micro-institutional-level factors that fish buyers use when selecting with whom to interact. These results are not surprising and consistent with existing theory and empirical research on overcoming transaction costs associated to incomplete contracts. Where legal enforcement mechanisms are scarce or costly, trust and trustworthiness play a key role in reducing transaction costs (Berg et al., 1995). While levels of trust vary across cultures (Henrich et al., 2005), empirical evidence is clear that trust and trustworthiness are associated with repeated interactions (Camerer, 2003; Engle-Warnick & Slonim, 2004) and that trust and relationship-building has a key influence on the persistence and success of buyer-seller relationships (Haugland, 1999; Powers & Reagan, 2007).

Our findings also show that differences in self-governance arrangements (in terms of their allocation of benefits and transaction costs) can be explained by understanding which levels of analysis (i.e., operational or collective-choice) the micro-institutional level factors are most likely to interact with. For instance, under self-governed patron-client relationships, the influence of trust-based interactions generated at the micro-institutional level only affects operational-level action situations. This is to be expected as fishers under this form of self-governance usually do not own the fishing means of production, property-rights or capital, and thus, do not have access to collective-action arenas to shape decisions about fishing and labor conditions, among other issues critical to their well-being. In contrast, in cooperatives, fishers can participate in shaping the operational and collective-action-level action situations, and so trust and trustworthiness generated at the micro-institutional level play a broader role in shaping the 'vertical' structure of this self-governance arrangement.

The benefits and risks inherent with group formation (itself a micro-institutional process) are more apparent in patron-client forms of self-governance. For instance, associating with trustworthy fishers lowers the transaction costs of contracting for the fish buyer and increases the likelihood that mutually beneficial gains can be found by both actors. For fishers, developing a trustworthy relation increases the likelihood he will also gain access to credit for purposes beyond the fishing arena. Fishers reported having access to loans to fix a boat or motor, buy vehicle parts, medical expenses or payment of credit tabs for groceries and household items at the local store, among others. It is well known that in rural developing country contexts, access to credit plays a key role in rural inhabitants' ability to secure better livelihoods (Zeller and Sharma, 1998).

Our longitudinal data set also illustrates two contrasting patterns of behavior in patron-client self-governance arrangements (Figure 3). The data shows instances where the patron interacted only once with many fishers who received a loan but did not return catch (bottom left of Figure 3). This untrustworthy behavior signified monetary losses to the fish buyer, and likely deterred him from future transactions with the same fisher. This situation can affect the structure of future operational-level action situations in this fishing community. For instance, when the pool of trustworthy fishers is exhausted, fish buyers face strong motivations to search for new labor elsewhere to fulfill seafood demand. The influx of fishers from other communities to which they do not belong is a persistent source of conflict in fishing (Marschke and Vandergeest, 2016; Njock and Westlund, 2010). Migratory labor can threaten the resilience of other forms of production as well, by stressing local fishers' ability to control access of migrant fishers to their common-pool resources (Bennett 2017; Bennet and Basurto forthcoming), as well as the provision of other public goods like health and schooling available in rural coastal communities (Bennett unpublished data).

The longitudinal data of Figure 3 also shows a group of fishers with whom the patron interacted most frequently (i.e., high number of loans and catch landed). According to the fish buyer, these are his most reliable, trustworthy labor force. Thus, he sees little risk on making loans to them regularly. Our interviews suggest that very few fishers are able to use this source of credit to acquire their own fishing means of production and become independent from the fish buyer. Overall, under this form of self-governance fishers may be particularly vulnerable to exploitation because they are often in perpetual debt to their patron and have no access to collective-choice arenas shaping their working conditions.

We should also point out that we found no linear relationship between loan lending and catch landing (Figure 3). That is, practically no fisher in our dataset was reliable 100% of the time. Although the patron we studied was one of the largest in the fishing community in terms of volume, there were nonetheless other fish buyers operating locally with whom he may have needed to compete to attract fishers to work for him. A fish buyer who is too strict about loan repayment may lose reliable fishers from his group, ultimately reducing his supply of fish. Furthermore, by allowing fishers who sometimes fail to repay loans to continue working in his group, a patron may be able to extend fishers' obligations and foster more stable buyer-seller relationships. In interviews, the fish buyer acknowledged that slippage by reliable fishers is part of the costs of doing business in these contexts, especially in situations where fishers face strong incentives to behave opportunistically, for example, in the case of income shortfalls due to a

family illness. Future work should investigate the factors that influence levels of trustworthiness, including local competition among buyers and economic and environmental factors that promote opportunism.

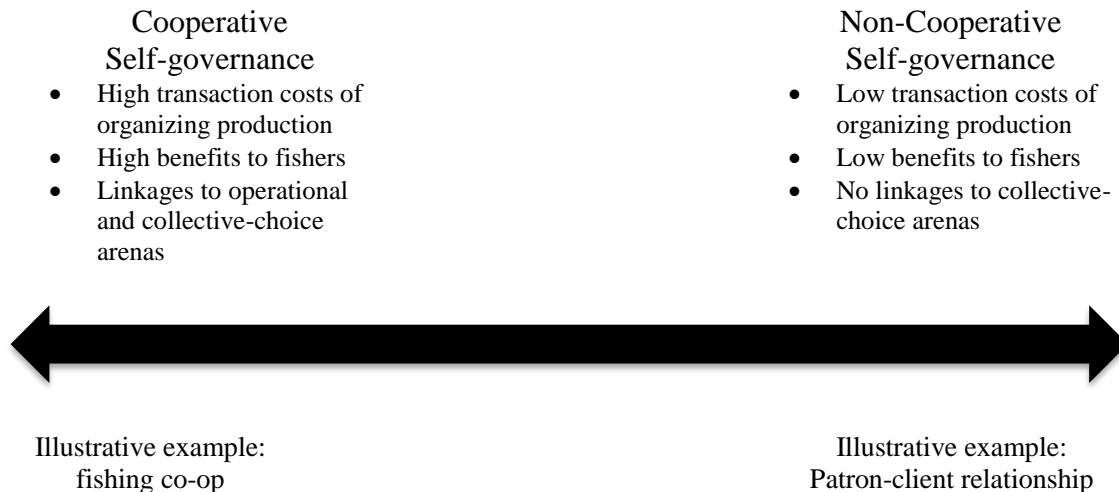
In contrast to a patron-client structure, findings within a cooperative environment suggest much higher levels of trustworthiness. Our longitudinal dataset (Figure 4) shows that most fishers transacting with the cooperative made payments on loans more frequently than they received loans, potentially indicating many small payments on large loans. Here, we caution that the cooperative data is not fully comparable with the patron-client data because the former compares loan frequency with repayment frequency and the latter compares loan frequency with frequency of landed catch, with frequency of landed catch and loan repayment similar yet slightly different measures of trustworthiness. Data on the monetary value of loans and levels of repayment would facilitate a formal comparison of patron-client and cooperative groups. Nonetheless, it appears that fishers working for the cooperative engaged in very frequent trustworthy behavior toward fulfilling their loans when compared with the fishers who transacted with the patron. In fact, a willingness to provide larger loans would suggest high levels of trust by the cooperative, which is only likely to emerge if fishers demonstrate high levels of trustworthiness.

Higher levels of trustworthiness among cooperatives than those of patron-client relationships is not surprising. As democratically owned and operated enterprises, cooperatives require sustained collective action to operate, including participation in meetings, providing opportunities for reputation- and trust-building among members. Field experiments demonstrated that members of agricultural cooperatives in the Philippines exhibited higher levels of trust and trustworthiness than non-member farmers (Becchetti et al., 2013). Unlike in patron-client relationships where property rights, capital, and financial resources are private goods of the patron, in cooperatives these goods are collectively provided and owned by all the members. As a result opportunistic behavior in patron-client relationships violates the trust of a single individual while in a cooperative it violates the trust of all the members. Furthermore, informal sanctioning of opportunistic behavior is more likely in a cooperative, where all members have an interest in each other's behavior than in a patron-client relationship where opportunistic behavior is a direct concern only of the patron himself.

Our analytical approach also suggests the diversity of self-governance arrangements are comparable along certain dimensions, such as how micro-institutional process of accessing fishing means of production, property-rights and capital play out. In the case of our study we locate them at either extreme of a continuum of self-governance types, based on the transaction costs they entail, the benefits they provide to fishers and the levels of interaction with the micro institutional level. We conceptually label these two extremes as the cooperative and non-cooperative self-governance following previous work in this area (Basurto et al., 2013). On one end, we find high transaction costs of organizing collective ownership and provision of capital and property rights by the fishers themselves, high benefits for fishers themselves as well as access to operational and collective-choice arenas. On the other end, we find the private provision and ownership of fishing means of production by one individual and thus lower transaction costs of organizing. Low benefits to fishers as high levels of debt accrue even to the most trustworthy fishers, and no access to collective-choice arenas of decision-making.

Hybrid forms are possible, for example when a small-group collectively owns and provides capital and property rights to external fishers, or sharing of property rights but not of financial resources. Where groups' structure is located within this continuum bears on the role that trust and other factors like transaction costs play within these two extremes.

Figure 5. Arranging these two forms of self-governance within a continuum of organizational types in SSFs (Basurto et al., 2013).



Conclusion

Our study illustrated how linking *micro-institutions* to operational level and collective-choice activities allows incorporating concerns that shape how harvesting activities take place. Issues like access to credit or fishing means of production, have often been overlooked in the literature of CPRs yet they shape overall outcomes, particularly in terms of the distribution of benefits generated by CPR harvesting. Our call to extend horizontally the analysis of CPRs as chains of action situations makes explicit the need to consider action situations where negotiations of access to inputs of production are being conducted (pre-harvesting), so that their interaction with operational level harvesting activities are better accounted for. This research agenda, resonates with Ostrom's call to increase attention to the interactions resulting from different action situations (Ostrom 2007, 2009), a call that has not been fulfilled to date. Our call to expand vertically to incorporate a micro-institutional level allows us to more explicitly account for factors such as trust and trustworthiness that drive group formation and shape actors' incentives and capabilities with regard to their engagement in operational and collective choice arenas. The conceptual devices we offer in this paper to 'extend vertically and horizontally CPR theory' help to move forward a 'beyond-harvesting' conceptualization of CPRs that has become dominant in CPR scholar production, and more explicitly incorporate the consideration of outcomes related to equity and distribution of benefits because it acknowledges that decisions around harvesting practices are influenced by how fishers organize to gain access to capital, labor, and commercialization. These are key aspects of concern for CPR governance and scholarship.

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