

The Goldilocks Solution: Exploring the Relationship between Trust and Participation in Resource Management within the New Zealand Commercial Rock Lobster Fishery

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*Our understanding of the role natural resource users, and the governing institutions they create, has grown considerably in recent years. At the same time, our understanding of the role of trust in human interactions continues to grow. We use the case of New Zealand rock lobster (*Jasus edwardsii* and *Jasus verreauxi*) to ask the question “What is the role of trust in an individual’s decision to participate in natural resource management institutions?” Using data from a survey of constituents of the commercial rock lobster fishery, our analysis shows an inverted “U” relationship between trust and participation. We suggest that this may be described as a “Goldilocks solution” in which having both too much and too little trust is problematic; but a healthy level of is “just right.” Theoretical and policy implications of these findings and directions for future research are explored.*

I. Why Participate in Resource Governance?

Commons, particularly ones that many groups depend upon for their livelihoods or cultural heritage, are often subject to overexploitation and degradation in what is referred to as the “tragedy of the commons” (Gordon, 1954; Hardin, 1968). However, a well-established body of evidence shows that resource users are capable of developing institutions to govern resource use and prevent overharvesting (Acheson, 2003; Gibson et al., 2000; Ostrom, 1990, 2005, 2009).¹

An interesting example of this dynamic emerged in the New Zealand rock lobster (*Jasus edwardsii* and *Jasus verreauxi*) industry in the early 1990s. A diverse group met near Gisborne, New Zealand to discuss the state of the local rock lobster fishery. Commercial fishermen, processors, exporters, recreational fishers, the local Iwis (customary Maori interests), and environmentalists all recognized the need for radical change in fishery management. Over many months, these groups forged an

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elegant 3-year agreement to rebuild the rock lobster stock. Parts of the agreement included commercial interests agreeing to not catch 50 percent of their allotted catch; seasonal closures; increased enforcement on recreational fishers; and a decrease in minimum catch size (Breen & Kendrick, 1997; Yandle, 2008a). The results helped the medium-term rebuilding of the fish stock (Yandle, 2008a). In this case, the commercial fishermen gave up immediate income to invest in the long-term development of the fishery. What explains the decision of fishermen to participate in fishery management despite the difficult choices they faced?

A key insight from related research is that repeated interactions in a community setting allow resource users to gain experience with each other and develop the social norms and trust necessary for successful resource management (Ostrom, 2000). These findings hold across cases observed in the field and in experimental settings (Ostrom & Walker, 2003). Thus, recent scholarship identifies trust as a key variable in individuals' participation in collective action for common pool resource management. But questions remain about how trust works and the relative importance of trust versus other variables (Ishihara & Pascual, 2008).

This study builds off of previous research and assesses the relationship between trust and participation in resource management. In particular, the study examines the nature of the relationship between trust and participation in New Zealand's rock lobster fisheries and to what extent there are patterns or changes in levels of correlation between fishers' level of trust and participation in resource management. Thus, our central research question is: *What is the role of trust in an individual's decision to participate in natural resource management institutions?* We use the results of a survey of nearly 150 rock lobster industry participants across New Zealand to quantitatively examine the degree to which industry participants trust other fishery interests and why they participate in fishery management. We use a quantitative case study of this unusual situation in which the commercial fishing sector undertook substantial resource management responsibility in order to better understand the relationship between trust and participation. These results are not intended to be broadly generalizable, but rather provide an opportunity to better understand this novel situation and lay the groundwork for further research.²

After a brief review of the theory driving this analysis, we provide background information about the New Zealand rock lobster case and descriptive survey results. This is followed by our in-depth analysis in which we define our variables, present our analytical methods (including model specification), and present our results. Finally, we conclude by summarizing our findings and discussing theoretical and policy implications.

II. Theoretical Background

This research is informed by a key theme in the literature surrounding the governance of the commons: the role of trust in individuals' decision to participate in resource management institutions. Below, we briefly summarize the key areas of debate in this literature and how our study will contribute to this discussion.

Concepts of Trust

Trust is broadly defined as a belief in the propensity of others to keep their promises and to carry out their promises with competency (Leach et al., 2002). This can also be reframed in terms of individual interests and boundedly rational decision making. When individuals approach a social dilemma such as whether to participate in managing a resource, they bring with them the lessons learned from previous experiences. Although trust is most commonly studied at the individual level, trust can also be conceptualized at an institutional level (Maloy, 2009; Rousseau et al., 1998). Scholz and Lubell (1998) argue that institutional trust is a key independent variable in managing and maintaining institutions, like systems of taxation.³ "Thus, at the core . . . are the links between the trust that an individual has in others, the investment others make in trustworthy reputations, and the probability of using reciprocity norms (Ostrom, 2003)." Ostrom's (2003) assertion is evidenced in recent experimental studies that emphasize the importance of repeated interaction and social history in fostering trust (Berg et al., 1995; Ostrom et al., 1992; Ostrom & Walker, 2003).

Although scholars have argued that repeated interactions prompt trust, and thereby participation in institutions, social context such as social status and closeness of race or nationality can contribute to trust (Berg et al., 1995; Glaeser et al., 2000). Interestingly, traumatic experiences, sustained periods of conflict, patterns of group discrimination, and lack of economic success in racially and economically mixed communities are all associated with low levels of trust (Adger, Brown, Tompkins, 2005; Alesina & LaFerrara, 2002; de Lopez, 2004). The lack of community trust caused by the sustained violent conflict contributed to the poor management of Cambodia's forests. Adger et al. (2005) also emphasize how power asymmetries can undermine trust, and thereby collective management of natural resources.

Despite the many different conceptualizations of trust, this study conceptualizes trust in a general manner. Yamagishi (2001) defines it as "a default expectation of the trustworthiness of other" (p. 24). This definition builds off of early works such as Rotter's (1980), which argues that general trust is defined by "believing communications in the absence of clear or strong reasons for not believing (that is, in ambiguous situations)" (p. 4). This definition is useful because it differentiates between generalized and particularistic trust. As discussed by Cook and Cooper (2005), "whereas general trust is trust in human beings in general, including strangers, particularistic trust is trust in a specific interaction partner" (p. 238). Thus, because in this study we are focusing on trust in multiple partners where participants do not necessarily "know" the individual partners they are interacting with, this conceptualization of generalized trust is most appropriate.

Understanding Participation

A different strand of literature on participation or collective action has also developed in recent years. The broadest and most widely read stream in this literature focuses on political participation. Political participation refers to people's decision to vote or engage in other forms of political action such as protest, campaigning,

or joining community groups. Early research was grounded in the rational choice literature and focused on whether individuals must be discontent in order to protest or engage in “unconventional participation” (Barnes & Kaase, 1979; Finkel & Muller, 1998; Gibson, 1991; Gurr, 1970). It also focused on whether and how rational choice could explain conventional political participation efforts such as voting and campaigning (Aldrich, 1993; Finkel & Opp, 1991). Whiteley offered an excellent analysis of this perspective (Whiteley, 1995). More recent analyses of political participation have focused on decidedly nonrational choice variables such as ethnic and linguistic heterogeneity, the characteristics of social networks (Heaney & Rojas, 2008; Siegel, 2009), and violent civil war conflict (Bellows & Miguel, 2009).

A smaller, although more relevant, literature focuses on participation in the management of common pool resources. This work is strongly influenced by Ostrom’s research on the ability of small groups to band together and successfully govern natural resources (Imperial, 1999; Ostrom, 1990). For example, Agrawal and Gupta (2005) find that in Nepal’s Terai, individuals with higher incomes, social status, and access to government offices and officials are most likely to participate in government-sponsored resource governance programs. With research focusing on the subjects of trust and participation in common pool resource management, it is important to examine the intersection and implications of these literatures.

Other literature flags the role of property rights in participation (Agrawal & Ostrom, 2001; Yandle, 2004) and the role of historical institutional context (Heinmiller, 2009). This research was originally grounded in discussions of the “tragedy of the commons.” It is argued that in the absence of a well-defined property rights regime, resources are prone to overexploitation (Gordon, 1954; Hardin, 1968). More recent analysis argues that secure long-term property rights provide an incentive for resource users to manage the resource sustainably, and that increasing the amount (or quality) of property rights held by users increases their incentive to participate in resource management (Hanna et al., 1996; Ostrom & Schlager, 1996). However, how or why this occurs is not so widely understood.

Trust and Participation in Natural Resource Management

The literature on common pool resource management identifies trust as an important component for participation in resource management. Examples include agricultural water supply in California (Lubell, 2007); a variety of watershed partnerships in western United States (Leach & Sabatier, 2005); Swiss land use planning (Hoppner, 2009); and even the decision to join an environmental organization (Sonderskov, 2009). These findings are supported by a variety of theoretical works and meta-analyses (Armitage, 2008; Ishihara & Pascual, 2008; Leach & Sabatier, 2005; Seabright, 1993) as well as experimental settings (Hayashi et al., 1999; Ostrom & Walker, 2003).

Furthermore, researchers have found that trust is a key component in promoting participation in institutions and in managing common pool resources. Almond and Verba (1963) noted this in their comparison of citizen participation in political groups across nations. They note, “In the United States and Britain the belief that people are

generally cooperative, trustworthy, and helpful is frequent, and it has political consequences. Belief in the benignity of one's fellow citizen is directly related to one's propensity to join with others in political activity" (Almond & Verba, 1963, pp. 229–30). Putnam (2000, p. 288) further elaborates on this by using social capital to explain how trust translates into increased political and civic participation. He explains that social capital provides a solution to collective action dilemmas by providing an "institutional mechanism with the power to ensure compliance with the collectively desirable behavior. Social norms and the networks that enforce them provide such a mechanism." In regard to property rights formation, Libecap (1989) notes that deception among interest groups when negotiating new property rights arrangements "can make political agreements more difficult by reducing any trust that might otherwise promote the more rapid . . . consideration of individual claim" (p. 24). In addition, Hanna and Jentoft (1996) argue the importance of trust to community-based management. In particular, "[m]embers adhere to norms and values not only because it pays or out of fear of sanctions, but also because they are involved and morally committed. The herdsman playing out the tragedy of the commons is acting rationally, but he is also acting immorally" (pp. 46–47).

A dissenting body of literature also exists. Cook et al. (2005) argue that trust can be complementary to cooperation, but is not necessary. Indeed, they point out that a lack of trust can lead to the development of institutional arrangements that promote cooperation (Cook et al., 2005). This is bolstered by Raymond's (2006) study of endangered species management in Las Vegas and Indianapolis. He finds that institutional mechanisms and political leadership can build cooperative behavior, noting "mutual trust is not a necessary condition for collective action . . . and, indeed, may be rendered irrelevant by other factors." Similarly, Hoppner (2009) specifically notes that "[t]rust is an important ingredient but far from a panacea in land use planning" (p. 1052).

There is also disagreement about the nature of the relationship between trust and participation. Although a high level of trust has been argued to act as a key independent variable essential to collective action, some have also argued that participation in institutions is a key factor in the creation or building of trust (Armitage, 2008; Koontz et al., 2004; Leach et al., 2002; Leach & Sabatier, 2005; Lubell, 2007). Lubell (2007) argues that familiarity among actors, through participation in institutional structures, is essential in building trust. Leach's (2002, 2005) quantitative case studies of watershed partnerships in California and Washington found that participation in partnerships, core beliefs, and institutional design influences the presence of and level of trust in resource management systems. Essentially, participation itself (along with other variables) may increase trust, thus leading to a reinforcing process.

This literature review reveals that the relationship between trust and participation is ambiguous and may be endogenous. While there is considerable research into other aspects of the relationship between trust and participation, quantitative evidence assessing the endogenous relationship remains sparse. Brehm and Rahn (1997) provide a strong example of a research design that tests the endogeneity of trust and civic engagement. Using pooled General Social Surveys from 1972 to 1994, they find that civic engagement and trust are in an endogenous relationship. In their

article, the connection is stronger from participation to trust rather than the reverse. However, as discussed earlier, much of the literature argues that the relationship is reversed—with trust influencing degree of participation.

This study builds off of previous research projects by examining the relationship between trust and participation in resource management systems. In particular, the study examines the nature of the relationship between trust and participation in New Zealand's rock lobster fisheries. Our results show that in the New Zealand rock lobster industry, a different dynamic than those presently described in the literature is at work—one in which there is a nonlinear relationship between trust and participation in resource management. The next section describes the New Zealand rock lobster industry. Following this description, the study defines the measurement of trust and other key variables in quantitative analysis. In addition, the statistical methods used to evaluate the relationship between trust and participation are described.

III. Background on the New Zealand Rock Lobster Industry

Fisheries management in New Zealand has a long history of innovation. New Zealand was one of the earliest nations in the world to adopt a "cap and trade" system for fisheries management (Annala, 1996; Batstone & Sharp, 1999; Boyd & Dewees, 1992). New Zealand continues to innovate with this management approach through measures such as introducing proportional allocation in 1990 and introducing cost recovery in 1994.⁴ Today, New Zealand's Quota Management System (QMS) is based on Individual Tradable Quotas (ITQs). ITQs provide a quota to each owner to catch a certain proportion of the Total Allowable Commercial Catch (TACC). There are 100,000,000 shares of each fish stock, so if a particular fish stock in 2010 has a TACC of 4,500,000 kg, a fisher owning 10,000 shares would have a 2010 Annual Catching Entitlement (ACE) of 450 kg of that fish stock. The ACE is only usable for the 2010 catching year and will expire if it is not caught (FishServe, 2010). However, the ITQs are perpetual, each year generating new ACE. Both ITQs and ACE, also referred to as "quota," may be bought and sold among commercial fishers and other interested parties. Essentially, these represent two different temporal qualities of right: the more durable ITQ (or "quota"), which is held in perpetuity, and each year generates varying tonnage of ACE depending on the TACC; and the short-term ACE, which can be purchased from ITQ owners, and expires at the end of each catching year.

New Zealand's QMS is the primary tool for regulating commercial fisheries, although it is supplemented with seasonal closures, gear limits, and other rules. Many fisheries in New Zealand are primarily or wholly fished by the commercial sector, with no recreational or customary Maori (indigenous) interests. However, in the inshore fisheries where there is substantial recreation and Maori interests, they are not incorporated into QMS. Instead they are regulated separately, with recreation and Maori focusing their efforts on traditional lobbying efforts, and resisting efforts to participate in broader management efforts. The result is a regulatory system in

which commercial fishing is the primary focus of management, and other interests exert their influence by lobbying.

A key change informing this study occurred in 1999 when New Zealand's fishery management law was amended to enable an additional institutional arrangement within the QMS in which some fisheries management responsibilities can be shared between the government and qualifying Commercial Stakeholder Organizations (CSOs). This change was largely the result of institutional changes over time, resulting in increasing activism and participation by the fishing industry in management. This process is already documented in the literature (Yandle, 2003, 2004, 2006, 2008) and is not repeated here. For the duration of this study, institutional arrangements (as well as political and industry leadership) remained constant.

Thus, this is not what the literature would describe as a traditional stakeholder group arrangement (e.g., Koontz et al., 2004), but rather a power-sharing arrangement between the regulator and the dominant regulated groups (the commercial fishing sector). This rather truncated model where participation in management is exclusively focused on the commercial sector dictates that, in our study, we focus only on participation of the commercial sector—as other broader fishery management interests are not directly included in this management approach. In the next section, the specifics of the rock lobster fishery are described.

The Rock Lobster Fishery

Rock lobster (*Jasus edwardsii* and *Jasus verreauxi*) is economically one of the most important fisheries in New Zealand. At the time of this study, it was the third largest export species, primarily shipped live to the Asian markets, and accounted for NZ\$21 million in 2007 (SeaFIC, N.Z.S.I.C., 2008). Fishing methods are an extension of traditional fishing practices, with lobster potting/trapping as the main catching method. One- or two-person boats that sell to large processors and exporters dominate the lobster fleet.

Beyond these statistics, however, lies a fishery with cultural and historical importance to many communities and interests throughout New Zealand (Johnson & Haworth, 2004; Webster, 2002). Historically, the Maori have a long tradition of inshore fishing different species for both subsistence and trade purposes. By the mid-twentieth century, rural Maori had an economy of joint reliance on both small-scale agriculture and inshore fishing (Johnson & Haworth, 2004; Levine, 1989; Memon & Cullen, 1992).

Rock lobster first became a commercially viable fishery in the early twentieth century (Johnson & Haworth, 2004), with exploitation characterized by classic boom and bust cycles. Some communities were exclusively dependent on rock lobster (Dana, 2003; Levine, 1984; Yandle, 2008b), while others relied on rock lobster as part of a broader economic mix. Today, rock lobster is also highly valued by the recreational sector (in some areas comprising a significant percent of total catch), while environmentalists express concerns about sustainability and illegal harvesting (MFish, 2006).

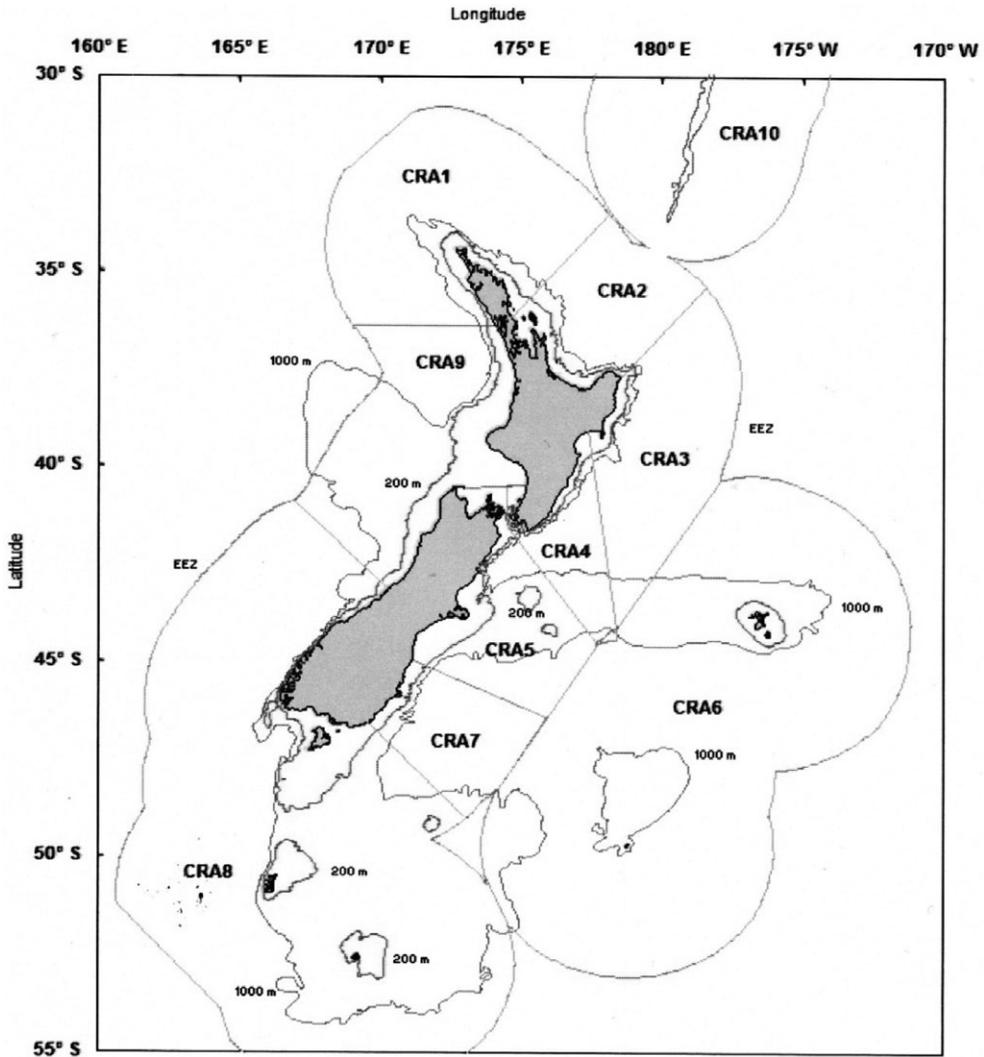


Figure 1. New Zealand Rock Lobster Management Areas.
Source: NRLMG (2006).

Industry Governance Arrangements

Within this highly visible context, the rock lobster industry is managed through New Zealand's QMS. There is a single national set of regulations (and a TACC) for "packhorse lobster" (*Sagmariasus verreauxi*), but the dominant species, commonly referred to as "rock lobster" (*Jasus edwardsii*), is governed by regional catch limits and regulation based on the areas illustrated in Figure 1. However, in practice, both packhorse lobster and rock lobster are broadly fished and managed concurrently, and referred to generically as "rock lobster."

In response to the 1999 fisheries management legislation enabling shared management responsibilities between governments and CSOs, the rock lobster industry

aggressively pursued opportunities to participate. Today, the New Zealand Rock Lobster Industry Council (NZ RLIC) is the national umbrella organization for the regional commercial stakeholder groups, namely the nine regional commercial stakeholder groups, referred to as Crayfish Management Advisory Committees (CRAMACs),⁵ which are based on the nine regional quota management areas for the species *Jasus edwardsii* (see Figure 1). It is the NZ RLIC and the CRAMACs that share management responsibility with the government (Ministry of Fisheries).

The NZ RLIC provides the CRAMACs with analysis, advice, representation, and advocacy on national-level issues, administrative and technical services, and assistance in developing regional management plans. The relationship between the CRAMACs and the NZ RLIC is a dual top-down/bottom-up relationship. While rules vary among CRAMACs, quota owners, quota holders, fishing permit holders, processors, and exporters, all are eligible for participation in CRAMACs. However, voting on key issues such as levies is restricted to industry participants who also own ITQs—the perpetual catching, not owners of ACE—which expires and must be bought annually if one does not own ITQs (Yandle, 2008a). Thus, as ITQ owners are the only participants eligible to engage in formal CSO decision making, these “constituents” are the focus of this study. However, many of the quota owners in this study also rely on ACE to varying degrees to supplement their quota holdings to a level that they can catch enough rock lobster to have an economically viable fishing business. It should also be noted that within the NZ RLIC and most CRAMACs, voting is conducted on the basis of “one share = one vote” rather than “one person = one vote.” Thus, in a contentious situation, individuals or companies who own more of the catching right have more votes.⁶

IV. Analysis

Survey Methods

In an effort to better understand the NZ RLIC and CRAMAC constituents and their motivations for participating in resource management, a survey of all constituents across all CRAMACs was conducted in 2007 (See Appendix A).⁷ For the purposes of this study, a constituent is defined as any individual or company that owns quota in the commercial rock lobster fishery.

New Zealand’s rock lobster industry is made up of a diverse set of individuals and companies with various experiences and goals. Over 85 percent of respondents had worked in the industry for more than 10 years. Almost half of the respondents planned to remain in the industry until retirement.⁸ Survey respondents represent a cross-section of the industry, with over 75 percent of respondents reporting that they were company affiliated, owner operators fishing on own quota with ACE supplements, and former industry participants. This is summarized in Table 1. The survey’s questions assessed the experience of a constituent with their CRAMAC and NZ RLIC (collectively referred to as “Commercial Stakeholder Organizations” or CSOs), their opinions of their CSOs, their level of participation in CSO activities, the quality

Table 1. Industry Roles Represented in Survey by Constituent Response and Quota Ownership

	% of Respondents	% of Quota Represented
Company-affiliated	24.31	50.55
Owner-operator using own quota	4.86	3.46
Owner-operator using own quota plus ACE	25.00	16.66
Owner-operator using ACE plus own quota	17.36	4.05
Former industry participant selling out ACE	25.69	22.24
Investor in quota	2.78	3.14

ACE, annual catching entitlement.

Table 2. Response Rates by Constituents and Quota Ownership

	Constituent Response Rate (%)	Quota Response Rate (%)
CRA 1	32.35	27.34
CRA 2	17.57	24.57
CRA 3	14.75	8.66
CRA 4	13.91	13.49
CRA 5	36.67	45.59
CRA 6	12.20	26.26
CRA 7	34.21	29.41
CRA 8	28.17	36.90
CRA 9	36.84	22.34
Overall	37.10 ^a	27.71 ^a

^aThis is different than the average of the nine regions because regions do not have a uniform population.

of their relationships with different fishery-related organizations, and their trust of those organizations.

Participation in the survey was voluntary, and constituents could skip questions.⁹ Surveys were distributed in March and June 2007 as part of regular NZ RLIC mailings to all constituents. Thus, all constituents were given two opportunities to participate in the survey. In the rare occasions (approximately a dozen) when a constituent returned more than one survey, the most comprehensively completed survey was used. This protocol resulted in an initial return of 194 out of 388 surveys (50 percent raw return rate) but a usable yield of 144 surveys (37.1 percent usable return rate). The primary reasons surveys were discarded were duplicate returns and responses indicating that they did not own quota (and, thus, were not constituents as defined in this survey). Response rates can also be measured as a percentage of the catch (measured as 2006–07 TACC) responding to the survey.¹⁰ Nationally, returned surveys accounted for 766,699 kg, representing 28 percent of the total 2006/2007 catch. A detailed presentation of response rate by constituents and quota ownership for each region is presented in Table 2. A key point to take from this table is that there was not a perfect correlation between constituent response and quota response. If we have a greater constituent response than quota response suggesting that results may be weighted toward those who own smaller amounts of quota, this

means our results reflect more the opinion of the entities participating in the fishery, rather than the quota ownership patterns.

Variables

Participation in Resource Management Activities. As discussed earlier, a key aspect of natural resource governance is active participation in resource management activity. To accurately measure this, constituents were asked to describe their participation in resource management activities on a scale ranging from 0 (never) to 4 (usually), with an option of "NA" if participation in such an activity was inapplicable. While all but four respondents participated in at least one low-cost activity, almost 35 percent of respondents did not participate in activities requiring higher levels of effort.

Looking at individual questions, respondents were more likely to participate in low-cost and low-commitment activities such as reading industry materials provided by NZ RLIC and the CRAMACs, or reading *Seafood New Zealand* (average response of 3.79 and 3.83, on the 0–4 scale, respectively). Constituents were less likely to participate in high-cost activities such as attending the annual SeaFIC, or NZFCF meeting or NZ RLIC seminars, with an average response of 1.14 and 1.18, respectively. However, participation in routine local activities, which indicates substantial involvement in fishery management (such as attending local meetings, participating in some monitoring activities, and careful selection of to whom ACE is sold), were widely reported.

These responses were then calibrated to reflect the respondents' intensity of participation given the activities they are able to participate in and their role in the industry. Because not all constituents can participate in all activities, each type constituent role was defined by what management activities they could participate in. For example, an investor can choose to whom they sell ACE, but cannot themselves use a logbook. Then this information was used to create an index of the number of activities engaged in and the degree to which constituents engage in the management activity. This is the index of total possible participation. For example, an investor can participate in a maximum of 10 activities, with a maximum participation level of "4" in each activity, for a maximum possible participation score of 40. Constituents' answers were then recoded to create a measure (presented as percent) of the number and degree participation possible they were engaging in. Using the example earlier, an investor self-reporting that they "usually do" all activities available to them would score a 40/40 or 100 percent. A different investor self-reporting that they "usually do" five activities, "sometimes do" two activities, and "never do" three activities would score 26/40 or 65 percent. This can be thought of as a measure of participation intensity because it includes both number of activities and degree of participation. Please see Table 3 for a list of which activities were classified as ordinary or difficult participation. Ordinary participation involves activities focused on self (record catch information, selling ACE) or the local community (attending local meetings). Difficult participation refers to actions on behalf of a larger group or requiring significant investment of time and money

Table 3. Summary of Variables

Variable Label	Description	Operationalization	Source	N	Mean (Sd)	Min	Max
Dependent variables							
percPart	Overall participation: Participation in all aspects of management that respondents' role in fishery allows	Respondents given points for both the number of activities they participate in and the degree to which they participate. Calculated as proportion of maximum possible participation. ^a	Survey questions 9 (a-k)	111	0.62 (0.26)	0	1
ordPart	Ordinary participation: Participation in local aspects of management (e.g., going to local events) as allowed by role in fishery	Respondents given points for the number of activities they participate in and the degree to which they participate. Calculated as proportion of maximum possible participation. ^a	Survey questions 9 (a-f, h, i)	111	0.73 (0.27)	0	1
diffPart	Difficult participation: Participation in "hard" aspects of management (e.g., be CRAMAC officer, attend national meeting) as allowed by role in fishery	Respondents given points for the number of activities they participate in and the degree to which they participate. Calculated as proportion of maximum possible participation. ^a	Survey questions 9 (g, j, k)	102	0.36 (0.34)	0	1
Explanatory variables							
percTrust	Generalized trust in fishery interests: Measures the level of generalized trust respondents have in other fishery interests. Presented as an index.	Sum of the trust answers divided by the sum of the highest possible trust answers. ^a	Survey questions 12 (a-g)	111	0.42 (0.13)	0	0.86
percTrust2	Trust squared						
pubTrust	Trust in general public/consumers	Calculated as answer given divided by 4 (4 being the maximum possible score)	Survey question 12 h	110	0.41 (0.20)	0	1
quantity	Individual catch quota in a given CRA as a percentage of the total catch quota for that CRA during the survey catching year	Survey respondents voluntarily provided FishSERVE client number, which we used to look up data. Data missing if client number was not provided.	Data purchased from FishSERVE	111	0.06 (0.09)	0	0.56
quality	Quality of catching rights: The proportion of catching right that was quota versus ACE (e.g., someone solely using quota would have a score of 1.00)	Survey respondents voluntarily provided FishSERVE client number, which we used to look up data. Data missing if client number was not provided.	Data purchased from FishSERVE	111	0.63 (0.43)	0	1

welcome	The degree that respondents felt welcome when they participate in fishery management activities	Scale of 0–4 taken directly from survey (0 = strongly disagree, 4 = strongly agree)	Survey question 8-l	111	2.98 (0.99)	0	4
myRelation	Professional relationships: The degree that respondents believe they gained better or more professional relationships by participating	The sum of respondents' answers divided by the sum of the highest possible scores	Survey question 11 (a, c, e, g, i, k)	111	0.66 (0.20)	0	1
memUnderstand	Understanding of members' interests: The degree that respondents believe they gain a better understanding of other NZ RLIC and CRAMAC members interests by participating	The sum of respondents' answers divided by the sum of the highest possible scores	Survey question 11 (b, d, f, h, j, l)	111	0.57 (0.26)	0	1
fishUnderstand	Understanding of fishery politics: The degree that respondents believe they gain a better understanding of fishery politics by participating	The sum of respondents' answers divided by the sum of the highest possible scores	Survey question 7 (c, d, e)	111	0.60 (0.26)	0	1
relUnderstand	Development of professional relationships and personal friendships	The sum of respondents' answers divided by the sum of the highest possible scores	Survey question 7 (h, i)	109	0.54 (0.28)	0	1
noreponse	CRAMAC confusion: Individuals who did not answer questions about the relationship of their CRAMAC with other organizations and interest groups. May suggest that an individual does not fully understand their CRAMAC	This is an indicator variable = 1 if a respondent skipped all the six questions about their relationship with CSO, 0 otherwise	Survey question 11 (b, d, f, h, j, l)	111	0.14 (0.34)	0	1
people	Number of people in a given CRA	N/A		111	100 (61)	19	421

Note: Explanatory variable summary based on the overall participation model.

^aSee text for detailed explanation of this calculation.

ACE, annual catching entitlement; NZ RLIC, New Zealand Rock Lobster Industry Council.

(attending annual meetings, holding position as officer, participation in research programs).

Across all constituents, the average participation intensity is 69 percent. The highest rate of participation is by owner/operator fishermen who catch solely their own quota (79.4 percent); followed by fishing companies owning quota (71.3 percent); and owner/operator fishermen catching on their own quota supplemented by ACE (71.2 percent). Lowest intensity is reported by former industry participants now selling ACE (65.0 percent) and investors with no previous industry experience (63.7 percent). Because this measure controls for eligibility to participate, and measures both number of activities and degree of participation, these results show a very strong degree of constituent participation in fishery management.

Trust in Other Fishery Participants. To assess levels of trust respondents held for their fellow industry participants as well as other interests in the rock lobster fishery, the survey asked to what degree the respondents trusted a variety of fishery interests to do "what is right." The scale of trust ranged from 3, representing "always trustworthy," to 0, "never trustworthy." The broad formulation of trust encourages respondents to substitute their own vision of "trustworthy," and thus makes results more easily comparable between individuals and between studies (Lubell, 2004). This question is based on a question used by the National Election Survey, which measures responses to the statement "You can generally trust the government to do the right thing (Scholz & Lubell, 1998)."¹¹ In this study, we use a single measure of trust applied to multiple parties.

Clearly, this is not an optimal measure and raises issues of measurement validity (Adcock & Collier, 2001), as well as difficulty in knowing what aspects of trust we are measuring (e.g., individual versus institutional versus ascribed characteristics). However, the limits of the survey instrument prevented us from adding a secondary measure to an already intensive survey (see Appendix A).¹² Furthermore, single trust measures have been published in well-respected journals in the recent past (Lubell, 2007; Sonderskov, 2009). Thus, we are using this measure, realizing that it is a generalized measure of trust with the limitations inherent to using a single measure.

Respondents were most trusting of organizations associated with the fishing industry. SeaFIC received the highest rating of trust with an average score of 2.01 (on the 0–3 scale, or trustworthy "most of the time"). Next, constituents felt that their CRAMAC was trustworthy "some of the time" with an average rating of 1.28. The least trusted organizations were groups that could be perceived by constituents as a competing interest. For example, Maori groups were trusted only "some of the time," with an average rating of 1.1. Next, recreational fishers received an average rating of 1.04, which means they were trustworthy only "some of the time." Environmental groups were the least trusted organization, with an average rating of roughly 0.80. This means they were not even trusted "some of the time."

From the above eight indicators, we have created a "trust intensity" measure. The trust index for a given respondent is the sum of the trust answers divided by the sum of the highest possible trust answers. For example, if a respondent

marked two questions with a 1, and the remaining six with a 2, then the trust index for that respondent is $(1 \times 2 + 2 \times 6) / (3 \times 8) = 0.58$ or 58 percent.¹³ The average of the trust index is .41, with 90 percent of responses falling between .29 and .54. There is one respondent with a score of zero, and one with the highest score of .88.¹⁴

Additional Variables. Several other variables (quantity, quality of catching right, welcome, and various measure of understanding gained by participation) are also included in our model. These are described in Table 3 and briefly below.

1. Quantity (quantity): measures the amount of rock lobster the respondent had the right to catch during the fishing year in a given region as a percentage of the total catch quota in that region. The higher the percentage, the more stakes a fisher has in the fishery. It can represent both a volume of activity and a degree of investment in (or commitment to) the fishery.
2. Quality of catching right (quality): represents to what extent the respondent holds quota versus ACE. As quota is a stronger catching right than ACE (see discussion earlier and Yandle, 2007) by allowing voting and providing a perpetual right, it represents a stronger position in the fishery, a longer time horizon, and (because it is more expensive than ACE) a greater investment in the fishery. Thus, a higher ratio represents a stronger quality of right, while a lower one represents a weaker quality.
3. Welcomed (welcome): measures the degree to which respondents felt their participation in fishery management was wanted and appreciated. The degree to which one feels welcome would influence their willingness to participate in management versus direct their efforts into other interests.
4. Professional relationships (myRelation): measures the degree to which respondents believe they have more or better professional relationships because of participation in management. This represents an intangible benefit respondents might receive from participating.
5. Understanding of member interests/fishery politics (memUnderstand, fishUnderstand): measures the degree to which respondents believe they have gained insights into the thinking of these other parties. This can be a nontangible benefit and is not necessarily correlated with trust.
6. CRAMAC confusion (noresponse): this variable flags individuals who did not answer questions about the relationship of their CRAMAC with other organizations and interest groups. A nonresponse itself may suggest that an individual does not fully understand their CRAMAC.

Table 4 presents the correlations between the main variables in the model. The only strong correlation is the one between the understanding of members' interests and the understanding of fishery interests. All the other correlations are modest to nonexistent.

Table 4. Correlations between the Main Variables (N = 111)

	percPart	percTrust	quality	quantity	welcome	memUnderstand	fishUnderstand	myRelation
percPart	1							
percTrust	0.131	1						
quality	-0.154	-0.135	1					
quantity	0.070	-0.048	0.363	1				
welcome	0.337	0.167	-0.122	-0.097	1			
memUnderstand	0.447	0.248	-0.313	-0.050	0.429	1		
fishUnderstand	0.265	0.230	-0.263	-0.062	0.420	0.751	1	
myRelation	0.304	0.316	-0.128	-0.031	0.152	0.173	0.056	1

Note: N = 111 based on the number of observations used in the main model.

New Zealand's rock lobster fishery presents a complex situation for a natural resource governance regime. Participation in fishery management takes place at individual, regional, and national levels, and involves varying levels of commitment by individuals, companies, and organizations. As characterized by this survey, commercial fishers are actively participating in management but express a wide variety of opinion over questions surrounding the degree to which they trust other commercial and noncommercial interests within the fishery. Below, we present our analysis of the relationship between trust and participation in resource management in the New Zealand rock lobster fishery.

Model

Table 3 presents a summary of variables used in our models. In addition to the overall level of participation, we use the "ordinary" and "difficult" measures of participation described earlier. The main variable of interest is the generalized trust in fishery interest (percTrust), and we add a square term of trust to our model to test for nonlinear effects (percTrust2). We use the fractional logit model proposed by Papke and Wooldridge (1996). Table 5 presents the results.

Because trust, our main variable of interest, enters with a squared term, its substantive impact on participation is not directly interpretable. The substantive impact of trust is shown in Figure 2. Predictions obtained by the fractional logit model are labeled GLM (predictions labeled IV and OLS are discussed in the Robustness section). As can be seen, trust and participation (ordinary and overall) are related in surprising ways. Trust follows an inverted U-curve for overall and ordinary participation. This illustrates a complex relationship in which both low and high levels of trust are associated with low participation. On the other hand, participation in activities requiring higher levels of commitment (difficult participation) declines monotonically as trust increases, which is also a surprising result. The implications of these findings, particularly the finding on the most important ordinary and overall participation, are discussed extensively in the conclusion.

There are two other surprising results. First, there is a negative relationship between participation in management and reporting increased understanding of fishery politics. At first, this is counterintuitive because it seems that the more one participates, the more opportunity one has to learn. One possible explanation is that

Table 5. Models of Participation, GLM Estimator

Variables	Participation		
	Overall	Ordinary	Difficult
percTrust	5.221** (2.400)	7.760*** (2.811)	-6.238 (5.101)
percTrust2	-6.281** (2.654)	-9.014*** (3.227)	3.114 (5.239)
quality	-0.308 (0.225)	-0.268 (0.295)	-0.258 (0.360)
quantity	1.893 (1.223)	2.916* (1.704)	0.0413 (1.245)
welcome	0.256** (0.106)	0.281** (0.135)	0.224* (0.132)
memUnderstand	1.549*** (0.472)	1.519** (0.621)	3.325*** (1.057)
fishUnderstand	-1.046* (0.548)	-0.834 (0.672)	-1.575 (1.038)
myRelation	1.367** (0.536)	1.336* (0.682)	3.335*** (0.846)
noresponse	-0.588*** (0.227)	-0.480* (0.276)	-0.697 (0.524)
logpeople	-0.185 (0.132)	-0.191 (0.187)	-0.162 (0.225)
constant	-1.403* (0.750)	-1.594* (0.927)	-1.621 (1.428)
N	111	111	102

Note: Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

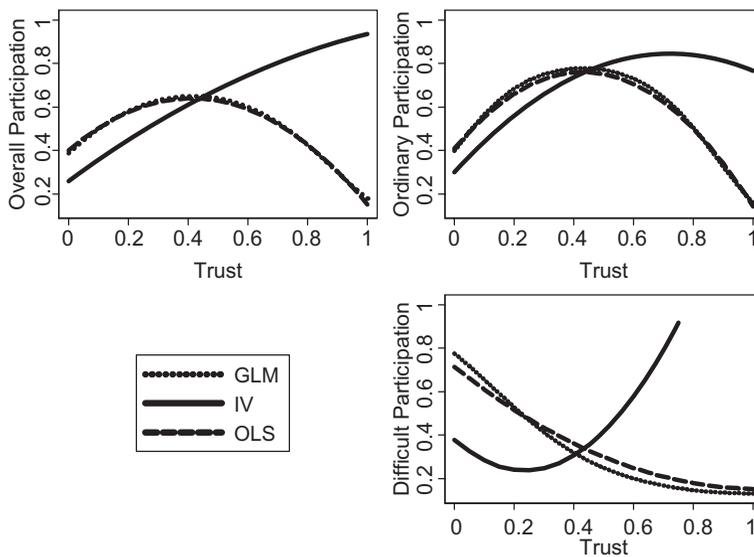


Figure 2. Marginal Effect of Trust on Participation.

fishers intensively involved in the fishery already understand fishery politics, and thus report little or no gain in understanding. Meanwhile, those less involved or new to the fishery gain their knowledge from the CSO rather than their own individual experience. This would fit with the pattern we observed during interviews for a subsequent project¹⁵ where it appears that relatively new entrants to the fishery perceived that they gained more than those with a longer tenure in the fishery. A newer fisher stated, "It [participating in management] is advantageous to see what's going on" (Interview 2167, June 2009), while one with considerable experience stated he "used to do tagging, logging all that stuff. Don't do it now . . . the guys on either side of me are doing it and I don't have the time" (Interview 0032, July 1, 2009).

Second, we find that quality of property rights held has a negative (but not statistically significant) impact on participation. This result is surprising as it is counter to much of the literature arguing that high-quality property rights are a necessary condition for participation in resource governance (Hanna et al., 1996; Libecap, 1989; Ostrom & Schlager, 1996). We believe that this finding is due to our narrow definition of property rights quality—that is, focusing solely on temporal quality rather than on a broader bundle of property rights (Ostrom, 1990; Yandle, 2007). Also, this dataset was truncated to only CSO stakeholders (see above), resulting in those fishing solely on ACE being excluded from the study. If this group was included, it is more likely that the relationship predicted by the literature would be found. Based on this unexpected finding, further analysis of the relationship between property rights and resource governance in this dataset is planned using a dataset that includes ACE-only fishers, and thus will not have such a truncated version of the property rights variable.

A review of the statistically significant variables in the models shows that those who report gaining better understanding of other CSO members and other fishery interests as well as more or better professional relationships all had higher levels of participation. Both of these findings confirm what the literature would predict.

Robustness Analysis

With much of the research on natural resource and fisheries management, endogeneity is an issue (Fisher et al., 2003; Haab & Hicks, 1997; Markusen et al., 1995; Thurman, 1986), as it indeed is with our research teasing out the relationships between trust and other variables. Within marine resource economics, the most frequently observed response to this issue is to either acknowledge endogeneity issues as one of the "usual limitations" (Nostbakken, 2008), then proceed using more specialized modeling tools, but cautiously interpret results (Haab & Hicks, 2000; Kumbhakar, 2002; McConnel & Tseng, 2000; Nostbakken, 2008), or to present an OLS regression model (Norman-Lopez & Asche, 2008).

If not controlled for, the presence of an endogenous regressor will produce biased estimates—it is not uncommon for the coefficient on an instrumented variable to reverse the sign. Therefore, we perform additional instrumental variable (IV) regressions to check for this possibility. We use trust in the general public as an instrument for trust in fishery interests. We use IV 2SLS with robust standard errors

and fail to reject the null of exogeneity across the three specifications of participation. This means we can treat trust as exogenous to the model.¹⁶ These results support our use of the models presented model presented above.

Because we performed the endogeneity test on a linear model, we also report the results of OLS with robust standard errors (which produce unbiased though inefficient estimates) and compare the marginal effect of trust with GLM and IV. Referring again to Figure 5, we can see that the marginal effects of OLS and GLM are practically indistinguishable. This is not surprising as we mentioned earlier that robust linear regression is unbiased when applied to fractional data. We provide the predictions based on the IV model for the sake of completeness.

V. Conclusions

This study uses a survey of constituents of the commercial New Zealand rock lobster fishing industry to examine the relationship between trust and participation in natural resource governance. This is an unusual case within a sophisticated resource management system because the commercial participants can actively participate in management. As such, it provides an unusual opportunity to understand the role of trust in the decision of whether and how to participate in management efforts. While not necessarily generalizable, this case provides the opportunity to identify important characteristics of the relationship between trust and participation in management, which can then be further examined in other settings. This fishery has an historic tradition of commercial community involvement, which has evolved over the last few decades. Descriptive results confirm that respondents are engaged in management activities, with an average participation intensity of 62 percent, as defined in the Variables section.

Statistical analysis shows unexpected results for both property rights and the relationship between trust and participation. Regarding property rights, our findings show an unexpected negative relationship between quality of property rights and participation. This relationship failed conventional levels of significance in two models but was barely significant in the overall model. While it is worth further investigation, this finding may have been caused by our relatively restricted definition of property rights quality. Nevertheless, this finding does illustrate a need for further future analysis.

Regarding the primary focus of this study, the relationship between trust and participation in fishery governance, findings were also unexpected. We found an inverted "U" relationship between trust and participation (ordinary and overall). This means that both low and high levels of trust are associated with lower participation levels, while the highest levels of participation were associated with medium levels of trust. This may be described as the "Goldilocks solution." Having "too much" trust is problematic because individuals are complacent without actively ensuring that things are run properly. Having "too little" trust often makes individuals so disbelieving that they are unwilling to participate in any activities. Thus, having a healthy level of distrust is "just right."

From a theoretical perspective, this is a novel finding because the literature predominantly argues that higher levels of trust are important for successful collective action or participation in resource management, while a smaller literature argues that trust is useful but certainly not necessary for successful cooperation or participation in resource management. Potentially, the findings of this study could offer a new line of exploration for reconciling these somewhat contradictory themes. By showing that, in our case, the highest levels of trust are not the most productive (in terms of increasing participation levels), and that people with varying levels of trust are capable and willing to participate, we open the door to a variety of other explanations. For example, there could be an optimal mix of trust levels working together that encourages both participatory activity and the building of robust institutions (as described by Cook et al., 2005). Or it could be that in different institutional settings or social settings, the optimal trust level for participation varies. Another interesting line of inquiry is why this curvilinear relationship exists. However, this study is a single-case study. Before exploring these possibilities, it is important to ascertain whether and to what extent similar relationships exist in other settings.

From a policy perspective, there are also some interesting implications. For example, both governments and nonprofits often expend considerable time and effort in trust- and confidence-building efforts. These findings suggest that after a certain point, these investments are not necessary, and can even be counterproductive. It also offers insights for selecting individuals to participate in stakeholder groups or similar efforts. The less obvious choice of a person showing some but not fulsome trust may be a better choice. In other words, the somewhat cynical person who always comes to public meetings but sits at the back of the room may become a very productive member of a stakeholder group if given the opportunity or encouragement.

This study shows that the relationship between trust and participation in resource management is more complex than is often described in the literature. Developing greater levels of trust may not always be the answer to increasing participation in natural resource governance. Instead, the "Goldilocks solution" of just enough trust (or distrust) may be optimal.

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Notes

1. Institutions refer to "stable sets of shared expectations about how people should and will behave in economic, political, and social settings. These expectations structure people's behavior by letting individuals know the consequences of their own actions as well as others" (Allio et al., 1997; Knight, 1992; North, 1990).
2. Gerring (2007) and Yin (2008) offer a broader discussion of the role of the case study in the social sciences.

3. Other analyses reaching similar conclusions include Cook and Gronke (2005); McAllister (1999); Welch et al. (2005); Vigoda-Gadot (2007).
4. For a complete list of innovations and discussion of these effects changes and their implications, see Yandle (2006).
5. Legally (and as illustrated in Figure 1), there are 10 crayfish management areas (CRAs). However, CRA 10 was created for administrative purposes alone and is not actively fished or managed for rock lobster.
6. However, in multiple interviews, officials with both the NZ RLIC and the CRAMACs pointed out that decisions were usually reached by consensus.
7. This survey was not pretested because most components of the survey had been used in previous survey instruments and had been used successfully in New Zealand fisheries. Response patterns and subsequent interviews revealed no evidence of respondent confusion.
8. These findings are derived from questions 5 and 6. Unfortunately, respondents did not provide uniform answers, with many of them providing varying year ranges, or remarkably obtuse responses (e.g., Q: "how long do you plan to remain in the CRA industry?" A: "how long is a piece of string?"). To best interpret these questions, we coded responses into categories, discarded the obtuse answers, and presented the categorical answers.
9. Please note, for this analysis, missing values (where respondents skipped a question) were left missing.
10. Response rate as percentage of catch could be calculated because respondents were asked to provide their FishServe identification number, which was then used to link their responses to their quota share and ACE holdings at the end of the 2006/2007 catching year.
11. This measure is also used in other published studies. Lubell (2004) is an example, although our scaling is different.
12. Questions that may seem less relevant to this study could not be removed from the study in favor of a second trust measure because the survey was a cooperative effort between the researchers and the NZ RLIC.
13. Please note that we use decimals (e.g., 0.58) in the statistical section, but for most reporting, we use the more intuitive percentages (e.g., 58 percent).
14. In developing this measure, we also experimented with two alternative measures of trust (although we did not report them). The first measure was "trust in industry," the second measure was "trust in outsiders." The measure we report here—general trust (percTrust)—contains both components, and thus we consider it the most stable and representative of the indexes.
15. Fishers were interviewed in June 2009, and no significant events occurred in rock lobster management between 2007 and 2007. Thus, we are confident that data from interviews and survey are comparable. Details about survey protocol and methods are available upon request.
16. Replication code and data available upon request.
17. Please note that formatting does not match original survey—this is modified to fit report format. All content remains unchanged.

References

- Acheson, James M. 2003. *Capturing the Commons: Devising Institutions to Manage the Maine Lobster Industry*. Hanover, NH: University Press of New England.
- Adcock, Robert, and David Collier. 2001. "Measurement Validity: A Shared Standard for Qualitative and Quantitative Research." *American Political Science Review* 95 (3): 529–49.
- Adger, W. N., K. Brown et al. 2005. "The Political Economy of Cross-Scale Networks in Resource Co-Management." *Ecology and Society* 10 (2): Available at <http://www.ecologyandsociety.org/vol10/iss2/art9/>
- Agrawal, A., and K. Gupta. 2005. "Decentralization and Participation: The Governance of Common Pool Resources in Nepal's Terai." *World Development* 33 (7): 1101–14.

- Agrawal, Arun, and Elinor Ostrom. 2001. "Collective Action, Property Rights, and Decentralization in Resource Use in India and Nepal." *Politics and Society* 29 (4): 485–514.
- Aldrich, John H. 1993. "Rational Choice and Turnout." *American Journal of Political Science* 37 (1): 246–78.
- Alesina, A., and La Ferrara. 2002. "Who Trusts others?" *Journal of Public Economics* 85 (2): 207–34.
- Allio et al. 1997. *The Political Economy of Property Rights*. New York: Cambridge UP.
- Almond, Gabriel, and Verba, Sidney. 1963. *The Civic Culture: Political Attitudes and Democracy in Five Nations*. New York: Sage Publications.
- Annala, John H. 1996. "New Zealand's ITO System: Have the First Eight Years Been a Success or a Failure?" *Reviews in Fish Biology and Fisheries* 6: 44–62.
- Armitage, Derek. 2008. "Governance and the Commons in a Multi-Level World." *International Journal of the Commons* 2 (1): 7–32.
- Barnes, Samuel H., and Max Kaase, eds. 1979. *Political Action: Mass Participation in Five Western Democracies*. Beverly Hills, CA: SAGE.
- Batstone, CJ, and BMH Sharp. 1999. "New Zealand's Quota Management System: The First Ten Years." *Marine Policy* 23 (2): 177–90.
- Bellows, John, and Edward Miguel. 2009. "War and Local Collective Action in Sierre Leone." *Journal of Public Economics* 93: 1144–57.
- Berg, Joyce, John Dickhaut, and Kevin McCabe. 1995. "Trust, Reciprocity, and Social History." *Games and Economic Behavior* 10: 122–42.
- Boyd, Rick O., and Christopher M. Dewees. 1992. "Putting Theory into Practice: Individual Transferable Quotas in New Zealand's Seafood Industry." *Marine Policy* 5: 179–98.
- Breen, Paul A., and Terese H. Kendrick. 1997. "A Fishery Management Success Story: the Gisborne, New Zealand, Fishery for Red Rock Lobsters (*Jasus Edwardsii*)." *Marine and Freshwater Research* 48 (8): 1103–10.
- Brehm, J., and W. Rahn. 1997. "Individual-Level Evidence for the Causes and Consequences of Social Capital." *American Journal of Political Science* 41 (3): 999–1023.
- Cook, Karen S., Russel Hardin, and Margaret Levi. 2005. "Experimental Studies of Cooperation, Trust, and Social Exchange." In *Trust and Reciprocity: Interdisciplinary Lessons from Experimental Research*, ed. E. Ostrom and J. Walker. New York: Russell Sage Foundation, 209–244.
- Cook, K. S., R. Hardin et al. 2005. *Cooperation Without Trust?* New York: Russell Sage Foundation.
- Cook, Timothy E., and Paul Gronke. 2005. "The Skeptical American: Revisiting the Meaning of Trust in Government and Confidence in Institutions." *Journal of Politics* 67 (3): 784–803.
- Dana, Leo Paul. 2003. "The Challenge of Exporting Fresh Food from the Chatham Islands to Markets Overseas." *British Food Journal* 105 (1/2): 9–22.
- Finkel, Steven E., and Edward N. Muller. 1998. "Rational Choice and Dynamics of Collective Political Action: Evaluating Alternative Models with Panel Data." *American Political Science Review* 92 (1): 37–48.
- Finkel, Steven E., and Karl-Dieter Opp. 1991. "Party Identification and Participation in Collective Political Action." *Journal of Politics* 53 (2): 339–71.
- Fisher, Carolyn, Ian W. H. Parry, and Willian A. Pizer. 2003. "Instrument Choice for Environmental Protection When Technological Innovation is Endogenous." *Journal of Environmental Economics and Management* 45: 523–45.
- FishServe. 2010. ACE [Online]. <http://fishserve.co.nz/information/ace/>. Available December 17, 2010.
- Gerring, J. 2007. *Case Study Research: Principles and Practices*. New York: Cambridge University Press.
- Gibson, Clark C., Margaret A. McKean, and Elinor Ostrom 2000. *People and Forests: Communities, Institutions, and Governance*. Cambridge, MA: MIT Press.
- Gibson, Martha Liebler. 1991. "Public Goods, Alienation, and Political Protest: The Sanctuary Movement as a Test of the Public Goods Model of Collective Rebellious Behavior." *Political Psychology* 12 (4): 623–50.

- Glaeser, Edward L., David I. Laibson, Jose A. Schienkman, and Christine L. Soutter. 2000. "Measuring Trust." *Quarterly Journal of Economics* 115 (3): 811–46.
- Gordon, H. S. 1954. "The Economic Theory of a Common-Property Resource: The Fishery." *Journal of Political Economy* 62 (2): 124–42.
- Gurr, Ted Robert. 1970. *Why Men Rebel*. Princeton, NJ: Princeton University Press.
- Haab, T., and R. Hicks. 1997. "Accounting for Choice Sets Endogeneity in Random Utility Models of Recreational Demand." *Journal of Environmental Economics and Management* 34 (2): 127–47.
- . 2000. "Choice Set Considerations in Models of Recreation Demand: History and Current State of the Art." *Marine Resource Economics* 14: 271–81.
- Hanna, S., C. Folke, and K. G. Maler, eds. 1996. *Rights to Nature: Ecological, Economic, Cultural and Political Principles of Institutions for the Environment*. Washington, DC: Island Press.
- Hanna, S. S., and S. Jentoft. 1996. "Human Use of the Natural Environment: An Overview of Social and Economic Dimensions." In *Rights to Nature: Ecological, Economic, Cultural, and Political Principles of Institutions for the Environment*, ed. S. S. Hanna, C. Folke and K.-G. Maler. Washington, DC: Island Press, 35–56.
- Hardin, G. 1968. "The Tragedy of the Commons." *Science* 162: 1243–48.
- Hayashi, Nahoko, Elinor Ostrom, James Walker, and Toshio Yamagishi. 1999. "Reciprocity, Trust, and the Sense of Control: A Cross-Societal Study." *Rationality and Society* 11 (1): 27–46.
- Heaney, Michael T., and Fabio Rojas. 2008. "Coalition Dissolution, Mobilization, and Network Dynamics in the American Antiwar Movement." *Research in Social Movements* 28: 39–82.
- Heinmiller, B. Timothy. 2009. "Path Dependency and Collective Action in Common Pool Governance." *International Journal of the Commons* 3 (1): Available at <http://www.thecommonsjournal.org/index.php/ijc/article/view/79/49>
- Hoppner, C. 2009. "Trust—A Monolithic Panacea in Land Use Planning?" *Land Use Policy* 26: 1046–54.
- Imperial, M. T. 1999. "Institutional Analysis and Ecosystem-Based Management: The Institutional Analysis and Development Framework." *Environmental Management* 24 (4): 449–65.
- Ishihara, H., and U. Pascual. 2008. "Social Capital in Community Level Environmental Governance: A Critique." *Ecological Economics* 68: 1549–62.
- Johnson, D., and J. Haworth. 2004. *Hooked: the Story of the New Zealand Fishing Industry*. Christchurch, New Zealand: Hazard Press.
- Knight, J. 1992. *Institutions and Social Conflict*. Cambridge: Cambridge UP.
- Koontz, T. M., T. A. Steelman et al. 2004. *Collaborative Environmental Management: What Roles for Government?* Washington, DC: RFF Press.
- Kumbhakar, S. 2002. "Risk Preferences and Technology: A Joint Analysis." *Marine Resource Economics* 17: 77–89.
- Leach, W. D., N. W. Pelkey et al. 2002. "Stakeholder Partnerships as Collaborative Policymaking: Evaluation Criteria Applied to Watershed Management." *Journal of Policy Analysis and Management* 21 (4): 645–70.
- Leach, W. D., and P. A. Sabatier. 2005. "Are Trust and Social Capital the Keys to Success?" In *Swimming Upstream: Collaborative Approaches to Watershed Management*. pp. 233–258. Cambridge: MIT Press.
- Leach, W. D., and P. A. Sabatier. 2005. "To Trust an Adversary: Integrating Rational and Psychological Models of Collaborative Policymaking." *American Political Science Review* 99 (4): 491–503.
- Levine, H. B. 1984. "Controlling Access: Forms of 'Territoriality' in Three New Zealand Crayfishing Villages." *Ethnology* 23 (2): 89–99.
- . 1989. "Maori Fishing Rights: Ideological Developments and Practical Impacts." *Maritime Anthropological Studies* 2: 21–33.
- Libecap, G. D. 1989. *Contracting for Property Rights*. Cambridge, UK: Cambridge University Press.
- Lubell, M. 2004. "Collaborative Watershed Management: A View from the Grassroots." *The Policy Studies Journal* 32 (3): 341–61.

- . 2007. "Familiarity Breeds Trust: Collective Action in a Policy Domain." *Journal of Politics* 69 (1): 237–50.
- Maloy, J. S. 2009. "Two Concepts of Trust." *Journal of Politics* 71 (2): 492–505.
- Markusen, J. R., E. R. Morey et al. 1995. "Competition in Regional Environmental Policies When Plant Locations Are Endogenous." *Journal of Public Economics* 56: 55–77.
- McAllister, I. 1999. "Political Performance and Institutional Trust." In *Critical Citizens: Global Support for Democratic Government*, P. Norris. New York: Oxford University Press, 188–203.
- McConnel, K. E., and W.-C. Tseng. 2000. "Some Preliminary Evidence on Sampling of Alternatives with Random Parameters Logit." *Marine Resource Economics* 14: 317–22.
- Memon, P. A., and R. Cullen. 1992. "Fishery Policies and Their Impact on the New Zealand Maori." *Marine Resource Economics* 7: 153–67.
- MFish. 2006. "The State of Our Fisheries 2006: Species Focus—Red Rock Lobster (*Jasus Edwardsii*)." Wellington.
- Norman-Lopez, A., and F. Asche. 2008. "Competition Between Imported Tilapia and US Catfish in the US Market." *Marine Resource Economics* 23: 199–214.
- Nostbakken, L. 2008. "Stochastic Modelling of the North Sea Herring Fishery Under Alternative Management Regimes." *Marine Resource Economics* 23: 65–86.
- North, Douglass. 1990. *Institutions, Institutional Changes, and Economic Performance*. Cambridge: Cambridge UP.
- NRLMG. 2006. "New Zealand Fisheries Assessment Working Group Annual Report." Wellington, New Zealand.
- Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. New York: Cambridge University Press.
- . 2000. "Collective Action and the Evolution of Social Norms." *Journal of Economic Perspectives* 14 (3): 137–58.
- . 2003. "Toward a Behavioral Theory Linking Trust, Reciprocity, and Reputation." In *Trust and Reciprocity: Interdisciplinary Lessons for Experimental Research*, ed. E. Ostrom, and J. Walker. New York: Russell Sage Foundation, 19–79.
- . 2005. *Understanding Institutional Diversity*. Princeton, NJ: Princeton University Press.
- . 2009. "A General Framework for Analyzing Sustainability of Social-Ecological Systems." *Science* 325 (5939): 419–422.
- Ostrom, E., and E. Schlager. 1996. "The Formation of Property Rights." In *Rights to Nature: Ecological, Economic, Cultural, and Political Principles of Institutions for the Environment*, ed. S. S. Hanna, C. Folke, and K. G. Maler. Washington, DC: Island Press, 127–56.
- Ostrom, E., and J. Walker, eds. 2003. *Trust and Reciprocity: Interdisciplinary Lessons for Experimental Research*. New York: Russell Sage Foundation.
- Ostrom, E., J. Walker et al. 1992. "Covenants With and Without a Sword: Self-Governance is Possible." *American Political Science Review* 86 (2): 404–17.
- Papke, L. E., and J. Wooldridge. 1996. "Econometric Methods for Fractional Response Variables with an Application to 401(K) Participation Rates." *Journal of Applied Econometrics* 11 (6): 619–32.
- Putnam, Robert. 2000. *Bowling Alone*. New York: Simon and Schuster.
- Raymond, L. 2006. "Cooperation Without Trust: Overcoming Collective Action Barriers to Endangered Species Protection." *Policy Studies Journal* 34 (1): 37–57.
- Rotter, J. B. 1980. "Interpersonal Trust, Trustworthiness and Gullibility." *American Psychologist* 35 (1): 1–7.
- Rousseau, D. M., S. B. Sitkin et al. 1998. "Not So Different After All: A Cross-Discipline View of Trust." *Academy of Management Review* 23 (3): 393–404.
- Scholz, J., and M. Lubell. 1998. "Trust and Taxpaying: Testing the Heuristic Approach to Collective Action." *American Journal of Political Science* 42 (2): 398–417.
- Seabright, P. 1993. "Managing Local Commons: Theoretical Issues in Incentive Design." *Journal of Economic Perspectives* 7 (4): 113–34.

- SeaFIC, N. Z. S. I. C. 2008. *Industry Fact File* [Online]. <http://www.seafoodindustry.co.nz/factfile>. Accessed May 20, 2008.
- Siegel, D. A. 2009. "Social Networks and Collective Action." *American Journal of Political Science* 53 (1): 122–38.
- Sonderskov, K. M. 2009. "Environmental Group Membership, Collective Action, and Generalized Trust." *Environmental Politics* 17 (1): 78–94.
- Thurman, W. N. 1986. "Endogeneity Testing in a Supply and Demand Framework." *Review of Economics and Statistics* 68: 638–46.
- Vigoda-Gadot, E. 2007. "Citizen's Perceptions of Politics and Ethics in Public Administration: A Five Year National Study of Their Relationship to Satisfaction with Services, Trust in Governance, and Voice Orientations." *Journal of Public Administration Research and Theory* 17 (2): 285–305.
- Webster, S. 2002. "Maori Retribalization and Treaty Rights to the New Zealand Fisheries." *The Contemporary Pacific* 14 (2): 341–76.
- Welch, E. W., C. C. Hinnant et al. 2005. "Linking Citizen Satisfaction with e-Government and Trust in Government." *Journal of Public Administration Research and Theory* 15 (3): 371–91.
- Whiteley, P. F. 1995. "Rational Choice and Political Participation: Evaluating the Debate." *Political Research Quarterly* 48 (1): 211–33.
- Yamagishi, T. 2001. "Trust as a Form of Social Intelligence." In *Trust in Society*, ed. K. S. Cook. New York: Russell Sage Foundation.
- Yandle, T. 2003. "The Challenge of Building Successful Stakeholder Organizations: New Zealand's Experience in Developing a Fisheries Comanagement Regime." *Marine Policy* 27 (2): 179–92.
- . 2004. "Developing a Co-Management Approach in New Zealand Fisheries." In *Evolving Property Rights in Marine Fisheries*, ed. D. R. Leal. Lanham, MD: Rowman & Littlefield Publishers, 213–238.
- . 2006. "Sharing Natural Resources Management Responsibility: Examining the New Zealand Rock Lobster Co-Management Experience." *Policy Sciences* 39 (3): 249–78.
- . 2007. "Understanding the Consequences of Property Rights Mismatches: A Case Study of New Zealand's Marine Resources." *Ecology and Society* 12 (2): Available at <http://www.ecologyandsociety.org/vol12/iss2/art27/>
- . 2008a. "The Promise and Perils of Building a Co-Management Regime: An Institutional Assessment of New Zealand Fisheries Management 1999–2005." *Marine Policy* 32 (1): 132–41.
- . 2008b. "Rock Lobster Management in New Zealand: The Development of Devolved Governance." In *Case Studies in Fisheries Self-Governance*, ed. R. Townsend, R. Shotton, and H. Uchinda. Rome: FAO, 291–306.
- Yin, R. K. 2008. *Case Study Research: Design and Methods*. Thousand Oaks, CA: Sage.

Appendix A: Survey Instrument¹⁷

July 2007 Survey of Rock Lobster Quota and ACE Holders

Thank you for participating in this survey. Your response will help build an understanding that will help researchers gain a more complete understanding of how CSOs work and the relationship between CSOs and their members. There are no known risks from your participating in this survey. All the information you provide will be kept confidential. Your individual responses will not be shared with the NZ RLIC or your CRAMAC. Participation in this survey is purely voluntary and you may skip questions or not return the survey. Results will be presented in aggregate (e.g., "25% of responders are owner/operators relying on a mix of quota and ACE"). **If you responded to this survey in May, thank you! You do not need**

to respond again. If you have not responded yet, we would appreciate receiving your survey by 15 August, 2007. Thanks for your help!

Tell us about you:

1. FishSERVE Client #: _____
2. What management area do you fish in? (e.g., CRA 1, etc): _____
3. Which of the following best describes you? Please check only one.
 - Quota manager, operations manager, employee or owner of fishing company
 - Individual owner/operator of fishing vessel—fishing solely on my own quota
 - Individual owner/operator of fishing vessel—fishing primarily on my own quota and some ACE
 - Individual owner/operator of fishing vessel—fishing primarily on ACE and some of my own quota
 - Individual owner/operator of fishing vessel—fishing solely on ACE
 - Former industry participant—now selling ACE or “leasing” annual quota rights
 - Investor in quota with no former industry participation
4. Is CRA your primary source of fishing income? _____
5. How long have you been involved the CRA industry? _____
6. How long do you plan to remain in the CRA industry? _____

Tell us about your experiences with your CRAMAC and the Rock Lobster Industry Council

7. To what extent have you gained the following from your experiences with your CRAMAC and the Rock Lobster Industry Council?

	none	some	a lot
A. Better understanding of members' interests			
B. Better understanding of other CSOs			
C. Better understanding of the Ministry of Fisheries			
D. Better understanding of other fishery interests (e.g., Maori, recreational fishers, environmentalists)			
E. Better understanding of the politics of the fishery			
F. Better understanding of the fishery biology			
G. Better understanding of the fishery ecology			
H. Professional relationships			
I. Personal friendships			

8. To what extent do you agree or disagree with the following statements about your CSOs (CRAMAC and Rock Lobster Industry Council's)

My CRAMAC and the New Zealand Rock Lobster Industry Council . . .	Strongly Agree	Neutral	Strongly Disagree
A. are encouraging communication among CRA industry members			
B. are providing a unified voice for CRA industry members			
C. are placing rules or guidelines on harvesting or selling (e.g., gear limits)			
D. are monitoring the condition of my fishery (e.g., scientific log program)			
E. are monitoring fishing activity of members			
F. are imposing penalties on members for breaking CSO rules			
G. are imposing penalties on members for breaking fishing law			
H. are providing a mechanism to resolve conflict between members			
I. are providing education and outreach programs to the public			
J. are providing a valuable service to the CRA industry			
K. are improving the condition of my CRA fishery			
L. welcome my participation			

9. To what extent do you participate in the following CRA fishery activities:

	Usually do this	Sometimes do this	Never do this	NA
A. Record catch information in CRAMAC logbook programs				
B. Return or log CRA tags				
C. Charter my vessel for stock monitoring/research programs				
D. Informally discuss fishery issues with CRAMAC officer				
E. Sell ACE only to fishers who will fish responsibly				
F. Sell ACE only to fishers to work in area I consider sustainable (an area that is not over-fished)				
G. Hold position as officer in CRAMAC or NZ RLIC				
H. Attend meeting in my community related to CRA or commercial fishing				
I. Attend local CRAMAC meetings				
J. Attend annual NZ RLIC meetings				
K. Attend annual SeaFIC or NZFCF meetings				
L. Read materials provided by NZ RLIC and the CRAMACs				
M. Read Seafood New Zealand				

10. How could your CSOs improve the service they provide to you? _____

11. Tell us about your experience with other fishery interests:
 How would you describe your CSO's (CRAMAC and Rock Lobster Industry Council's) relationship with the following organizations using this scale?

		Very Positive	Very Negative	NA
Ministry of Fisheries	A. my relationship			
	B. CSO's relationship			
Seafood Industry Council (SeaFIC)	C. my relationship			
	D. CSO's relationship			
Recreational Fishers	E. my relationship			
	F. CSO's relationship			
Environmental Groups	G. my relationship			
	H. CSO's relationship			
Customary Maori	I. my relationship			
	J. CSO's relationship			
General Public/Consumers	K. my relationship			
	L. CSO's relationship			

12. How often can you trust the following organizations or groups of people to do "what is right"?

	Always	Most of the time	Some of the time	never
A. Ministry of Fisheries				
B. Seafood Industry Council (SeaFIC)				
C. Rock Lobster Industry Council				
D. My CRAMAC				
E. Recreational Fishers				
F. Environmental Groups				
G. Customary Maori Groups				
H. General Public/Consumers				

Thank you for participating in this survey! Please direct any questions or concerns related to the research to:

{Contact information removed for peer review}

Please use the enclosed postage-paid envelope to return the survey by August 15, 2007.

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