

Sharing natural resource management responsibility: Examining the New Zealand rock lobster co-management experience

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Abstract Co-management, in which government and resource users share responsibility for managing a natural resource, is attracting considerable attention in both public policy and common pool resource research. However, little is understood about how this approach arises in a mature regulatory setting, or about its strengths and weaknesses. This study uses the experience of the New Zealand rock lobster (*Jasus edwardsii* and *Sagmariasus verreauxi*) industry to illustrate what co-management is and how it develops. This is followed by an assessment of co-management in this regime. Development of co-management is an evolutionary process that requires commitment from both government and industry. Strengthened property rights and management expertise provide the incentives and tools to develop a robust co-management regime. However the characteristics of the property rights bundle must be carefully matched to the regime's biological, social, and regulatory setting.

Keywords Co-management · Natural resource management · Fisheries · New Zealand · Rock lobster · *Jasus edwardsii* · *Sagmariasus verreauxi* · Common-Pool Resource (CPR) · Property rights · Individual Tradable Quota (ITQ)

Introduction

The world's fisheries are important natural resources,¹ yet are under threat of over-exploitation.² Highly valued migratory, pelagic, and groundfish species are particularly

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¹ The world's marine catch was estimated to be nearly 133 million tonnes in 2002. It provided direct employment for 36 million people in 1998, and has an estimated 2002 trade value of US\$ 59.5 billion (FAO, 2004: 11, 213).

² The FAO estimates that for major marine fish stocks, 52% are fully exploited, 17% are over-exploited, and an additional 8% are depleted or are recovering from depletion (FAO, 2005: 6).

threatened (Myers and Worm, 2003). Since most fishing takes place within the territorial waters of individual nations, this is an important issue for environmental policy to address. Insights from the Common-Pool Resource (CPR) literature (Dolsak and Ostrom, 2004; Hanna et al., 1996; Tang, 1991; Ostrom, 1990) can help with this endeavor. Co-management, in which government and the resource users share management responsibility, is a promising solution (Berkes, 2004; Noble, 2000; Wilson et al., 2003).

The case of the New Zealand rock lobster (*Jasus edwardsii* and *Sagmariasus verreauxi*) illustrates the promise and perils of this approach and the ways in which co-management develops. New Zealand rock lobster management is intriguing because it offers an opportunity to examine the effects of two innovative natural resource management approaches: Individual Tradable Quotas (ITQs) and Co-management. Since both approaches are in the early stages of application or are being examined for broader adoption in other nations, such as the United States, the New Zealand situation provides an opportunity to learn from its experience and to apply theoretical insight from the CPR literature to public policy.

After a brief review of the key findings and applications of the CPR literature, New Zealand rock lobster will be used to consider questions about the origins of co-management such as: How does the co-management approach develop when there is already a mature regulatory system in place? Or, how does co-management work in an industrialized setting? This leads to an assessment, using the criteria in the CPR and the public policy literatures, of co-management as a policy tool, and to a discussion of how well-defined property rights and evolutionary development are key to developing a robust co-management regime.

Insights from the Common-Pool Resource (CPR) literature

Broadly understood, a Common-Pool Resource (CPR) is a resource with two characteristics – it is subtractable (one person's use of the resource reduces the ability of others to use it) and it is costly or difficult to prevent potential users from accessing the resource (Dolsak and Ostrom, 2004). Key issues in the CPR literature include: how CPR management institutions develop and are sustained, the role of rules and rule making in CPR institutions, and the role of property rights in CPR institutions (Hanna et al., 1996; Ostrom et al., 1994).

The CPR literature recognizes a variety of ways to manage common-pool resources including: markets, bureaucracy, community, and co-management. A brief definition and description of each approach is presented below in Table 1. The key point of this table is that there are multiple approaches to manage common pool resources, and these approaches vary according to who holds what property rights and the resulting characteristics of the approach. An important theme in the literature is the importance of appropriately matching the management approach with the institutional and physical characteristic of the CPR.³

Defining co-management

There are diverse definitions of co-management within the natural resource literature (Berkes, 2004; Jentoft, 1989; Noble, 2000; Yandle, 2003). However, co-management may be broadly defined as any one of a variety of institutional arrangements in which groups of resource users – individuals, communities, or companies – share with government the property rights,

³ See Imperial and Yandle, 2005 for a detailed summary and discussion of this literature and of the four main approaches to common-pool resource management.

Table 1 Summary of common-pool resource management approaches (adapted from Imperial and Yandle, 2005)

Key characteristics	Representative citations
Bureaucracy-Based	Kaufman, 1960; Koontz, 2002; O’Leary et al., 1999
<p>Government control by regulation</p> <p>Focus on managing inputs</p> <p>High monitoring and enforcement costs</p> <p>Difficulty linking rules and local conditions</p> <p>Scientific uncertainty possibly leading to over-harvesting</p> <p>Rent-seeking behavior when developing regulations</p> <p>Potential for agency capture by interest groups</p> <p>Accountability through government mechanisms</p>	
Market-Based	Anderson, 1989; Squires et al., 1995; Anderson and Leal, 2001
<p>Catching or emission rights transferred from government to users, while other rights remain with government</p> <p>Economically efficient resource allocation by trading harvest rights or emissions rights (e.g., Individually Tradable Quotas – ITQs for catching fish stocks, or SO₂ emissions permit trading)</p> <p>Focus on managing outputs</p> <p>Difficulty linking rules and local conditions</p> <p>Unemployment and loss of small harvesters (less relevant to emissions trading)</p> <p>Higher incomes for remaining harvesters; industry consolidation</p> <p>Rent-seeking on rights allocation</p> <p>Agency capture by harvesters or emitters</p> <p>Scientific uncertainty in setting harvest or emission limits</p> <p>Accountability through government mechanisms</p>	
Community-Based	Ostrom, 1990; McCay, 1998; Berkes, 2004
<p>All property rights held by government or group within community</p> <p>Locally managed and strong harvester control</p> <p>Culture and small-scale harvesters preserved</p>	

(Continued on next page)

Table 1 (Continued)

Key characteristics	Representative citations
Focus on managing input or outputs	Acheson, 2003; Singleton, 1998; Sen and Nielson, 1995; Wilson et al., 2003
Congruence between rules and local conditions	
Difficulty addressing threats from outside harvesters	
Economically inefficient	
Subject to capture by local leaders	
Vulnerable to rapid changes in technology, stock, or culture	
Accountability through social mechanisms	
Limited external accountability	
Suite of rights (including management) shared between user groups and government	
Greater fisher involvement in resource management	
Focus on managing inputs or outputs	
Management costs shifted from government to industry	
Possible vulnerability to lack of management capacity	
Congruence between rules and conditions	
Difficult for non-harvester interests to participate	
Agency capture by harvesters	
Lower scientific costs and better use of time/place information	
Danger of poor government oversight and reduced accountability	

and thus the responsibility for managing a natural resource. Examples of co-management are:

- In New Zealand, the Challenger Scallop Enhancement Company (composed of the owners of scallop-catching rights) provided enhanced fishery management services such as stock enhancement, research, and compliance monitoring. These activities were funded by self-imposed levies administered in conjunction with the government (Arbuckle and Metzger, 2000)
- In Mexico, a forest community found a decrease in tree theft after a co-management regime (in which traditional community based management was incorporated with the government's science-based management) gradually replaced a purely government based management regime, (Klooster, 2000).
- In Washington State, after a long history of court conflict and negotiation, tribal governments in Puget Sound share the responsibility for managing the salmon fishery with state government (Ebbin, 2004).

These examples illustrate that in co-management, the resource users – a community or a group of firms – partner with the government to ensure that a resource is used sustainably.

Understanding how co-management regimes develop

Co-management regimes have developed in two ways: by an evolutionary process and in response to a crisis. Evolutionary development occurs when long-standing local institutions (traditional or indigenous management regimes) become interwoven with the larger regional or central government (Acheson and Taylor, 2001). For example, in the Maine lobster fishery, traditionally followed gear or catching rules were incorporated into state laws (Acheson, 2003). In many cases, the origins of the underlying institutions are lost in the mists of time, yet they are maintained in a modern co-management form. Examples include: common pastures in Torbel, Switzerland, and *zanjeras* (irrigation societies) in the Philippines (Ostrom, 1990).

With more recently developed co-management regimes, co-management approaches are most likely to be adopted when there is a time of extreme stress within the fishery management system. Pinkerton notes that “co-management is most likely to develop out of a real or imagined crisis in stock depletion or a problem of comparable magnitude” (Pinkerton, 1989: 27). Other conditions identified by Pinkerton are: the willingness of fishers to contribute to regime financing and management, and development occurring as a result of a negotiation or an experimental process. Pomeroy and Berkes have argued that a broader set of crisis-oriented conditions can lead to co-management development. Such conditions include “resource deterioration, conflict between stakeholders, conflict between management agencies and the local fishers, and governance problems in general” (Pomeroy and Berkes, 1997: 476). Thus, in recently developed co-management regimes, the conditions most likely to lead to a sustained co-management approach are those in which there is a perceived crisis – most often within the fishery itself, but also out of conflict among stakeholders and management agencies.

The role of property rights

Another important stream of thinking regards the development of co-management as a response to the issue of property rights. Property rights can be defined as:

... enforceable authority to undertake particular actions related to a specific domain. For each right an individual holds, rules exist that authorize or require particular actions in exercising that property right (Ostrom and Schlager, 1996: 130).

Thus, explicit or implicit responsibilities come with property rights. Furthermore, increasing the amount (or quality) of property rights held by users increases their incentive to participate in resource management (Ostrom and Schlager, 1996; Hanna et al., 1996).

Ostrom and Schlager (1996: 143) show “cumulatively, individuals must perceive that long-term costs of controlling externalities will be less than long-term benefits – both for the group and for those individuals who undertake collective action.” Increased property rights are a mechanism for doing this since appropriately defined property rights provide the assurance that those who conserve a resource at a given time will benefit from that conservation at a later time. Ostrom and Schlager divide the broad concept of property rights into a “bundle” of five specific rights: access (right to enter); withdrawal (right to take resource); management (right to regulate use patterns and resource improvement); exclusion (right to determine who has the right of access and how that right is transferred); and alienation (right to sell or lease management and the right of exclusion). Although typologies of property rights vary (Hanna et al., 1996), there is agreement that when individuals or groups of resource users have a strong set of property rights to a CPR, the security provided by the property rights increases the incentive for them to manage the resource sustainably over a long period of time (Ostrom and Schlager, 1996: 137). In particular, research shows that, at a minimum, access, withdrawal and management rights are necessary (although exclusion rights are also desirable), if users are to have sufficient incentive to use and manage a resource sustainably (Ostrom and Schlager, 1996; Agrawal and Ostrom, 2001).

The linking of property rights and governance has important implications for development of co-management. For example, it is argued that a primary reason for the failure of some fishers to form self-governing organizations is a combination of information costs and conflict over distribution of the resource. However, Anthony Scott argues, with respect to Individual Tradable Quotas (ITQs), “the distributional obstacles ... cannot be solved endogenously. ITQs provide a ready made exogenous distribution basis” (Scott, 1993). He adds that once ITQ regimes are set up, self-governing fisher organizations are likely to succeed, because they are better able to work together without fear that their share of the resource will be diminished.⁴ In the case of New Zealand fisheries, there is evidence that at the national level, the process theorized by Scott has indeed taken place (Yandle, 2003, 2005). However, precisely how this dynamic works within an individual fishery has not yet been fully investigated.

Methods

Rock lobster management in New Zealand provides the opportunity to examine co-management in a particularly revealing context: a fully developed fishery with a modern regulatory regime based on ITQs already in place when co-management emerges. As such, it provides direct parallels to fisheries management regimes in much of the developed world and lessons for nations either using, or considering adoption of property rights based approaches.

⁴ McCay et al. (1998) express caution about this, suggesting that the development of co-management may also be due to the community created by ITQs. More important, the authors raise equity and management concerns because ITQ owners have the power and the incentive to choose the narrower interests of ITQ owners over broader fishing community interests.

The data presented in this study were gathered primarily through original historical documents, but also through interviews with national and regional leaders of the rock lobster industry. The data were largely gathered in May–July 2003 and June, 2004, although follow-up interviews were also conducted in December, 2005. A summary of the data and their contribution to this research is presented in Table 2.

The analysis of these data followed the principle of triangulation (Yin, 1993). According to Putnam (2000: 415), “No single source of data is flawless, but the more numerous and diverse the sources, the less likely that they could all be influenced by the same flaw.” Thus, whenever possible, combinations of multiple documentary sources and/or multiple interviews have been used to reconstruct and confirm information presented.

A brief profile of the New Zealand rock lobster industry

Rock lobster is an export species, primarily shipped live to the Asian markets. It is the fourth largest fish export species, accounting for NZ\$ 101.5 million in 2004 (SeaFIC 2006). Current fishing methods are an extension of traditional fishing practices, with lobster potting/trapping as the main harvesting method. Nationally, one or two person boats that sell to large processors and exporters have dominated the lobster fleet. However, since the 1990 introduction of ITQs, there has been some evidence of a shift from independent fishers to more vertical integration.

New Zealand’s Quota Management System (QMS) for fisheries (of which rock lobster management is a part) is based on an ITQ model in which the rights to catch a certain proportion of the Total Allowable Commercial Catch (TACC) are held. The rights may be bought and sold among fishers and other interested parties. ITQs are the primary means of regulation, although they are supplemented by input controls such as catching method restrictions. Within the rock lobster fishery, 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 nine regional commercial stakeholder groups (CRAMACs)⁵ 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 1999, the law governing New Zealand fisheries management 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). Within the rock lobster industry, The New Zealand Rock Lobster Industry Council (NZ RLIC) is the national umbrella organization for the regional commercial stakeholder groups, namely the nine CRAMACs (seven incorporated, two more informal) that are based on the nine regional quota management areas for the species *Jasus edwardsii*. While rules vary from CRAMAC to CRAMAC, quota owners, quota holders, fishing permit holders, processors, and exporters are all eligible for membership in most CRAMACs. Each CRAMAC nominates a representative to the board of the NZ RLIC and contributes to the national organization’s operational budget in proportion to the amount of TACC for its region. Funding is through a statutory levy on all rock lobster ITQs. CRAMACs are usually

⁵ CRAMACs are the regional rock lobster management groups. The term “CRAMAC” is a combination of two acronyms – CRA is the QMS acronym for rock lobsters (*Jasus edwardsii*) derived from the informal term “crayfish,” and MAC is derived from “Management Advisory Committee.” Legally (and as illustrated in Figure 1) there are 10 CRA management areas. However CRA 10 was created for administrative purposes alone and is not actively fished or managed for rock lobster.

Table 2 Summary of primary research methods

Data	Source	Date of research	Contribution to research
Historical Documents	New Zealand Rock Lobster Industry Council (NZ RLIC) Archives	2003, 2005	Government and industry reports, meeting minutes, stock assessments, formal and informal correspondence. Used to document development of co-management data for development of Figure 2, background materials for interview with Daryl Sykes and Andrew Branson.
	New Zealand Seafood Industry Council (SeaFIC) Library	2003, 2005	Published research, popular press stories, and industry trade articles, stock assessments. Used to document development of co-management data for development of Figure 2, background materials for interview with Daryl Sykes and Andrew Branson.
National Interviews	Daryl Sykes, Chief Executive, NZ RLIC	2003, 2005	First person recollections of co-management development from industry perspective, organization of NZ RLIC, understanding of how NZ RLIC interacts with government and regional rock lobster interests, assessment of current state of co-management at the national level.
	Andrew Branson, Chairman, NZ RLIC	2005	First person recollections of co-management development from government and broad industry perspective, assessment of current state of co-management at the national level.
Regional	Ron Brady (CRA 7)	2004	Some first-person recollections of co-management development at the regional level, discussion of CRAMAC organization and activities, understanding of
Leadership	Jeff Clarke (CRA 6)	2005	relationship between NZ RLIC and individual CRAMACs, understanding of
Interviews	Gordon Halley (CRA 3)	2005	variety of challenges that individual CRAMACs face, documentation
	Malcom Lawson (CRA 8)	2004, 2005	and better understanding of past and current innovations at the regional level
	Larnee Wichman (CRA 5)	2004	

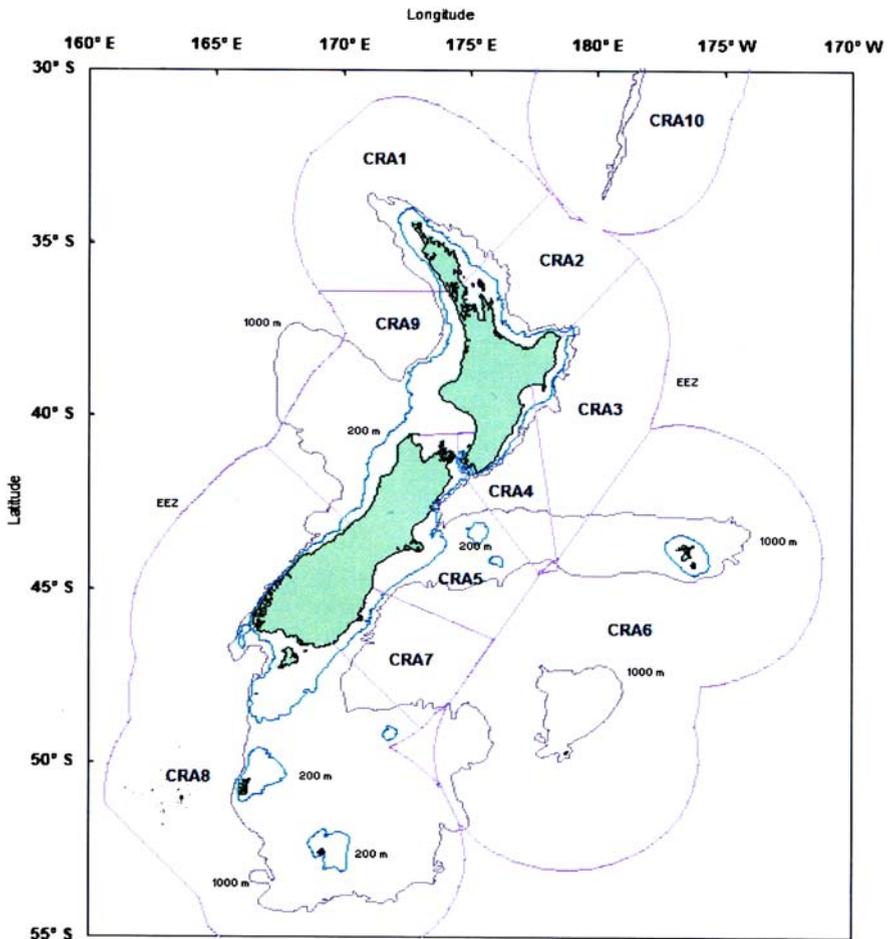


Fig. 1 New Zealand rock lobster management areas (NRLMG, 2005: 2).

focused on research and management issues at the regional or fish stock level. The NZ RLIC provides the CRAMACs with analysis, advice, representation and advocacy on national-level issues; with administrative and technical services, including the provision and/or coordination of stock assessment research; with assistance in developing regional management plans and/or harvest strategies; and with other technical assistance. The relationship between the CRAMACs and the NZ RLIC is a dual top-down/bottom-up relationship. Information, expertise, and responsibilities flow in both directions. In addition, sharing of information and discussions occur between CRAMACs themselves, independently of the NZ RLIC.

Explaining the development of co-management in the rock lobster industry

If co-management is to be a viable option for environmental policy, it is important to understand the process by which it develops. Traditionally, the common pool resource literature suggested that co-management develops either from a merging of traditional

community-based management with government powers (Ostrom, 1990; Jentoft, 1989) or out of crisis (Pinkerton, 1989; Pomeroy and Berkes, 1997). However, neither of these scenarios fully explains the development of co-management in New Zealand or the rock lobster industry (Yandle, 2003, 2005). Instead, this case suggests two linked explanations: a strong tradition among rock lobster fishers of involvement in fishery management or governance that progresses over several decades from an informal to a formal management structure; and the development of perceived property rights in the broader New Zealand fishing industry. Finally, the political context in which these developments occurred deserves attention.

Historical development

The rock lobster is intertwined with New Zealand history. Indeed, the Maori who first arrived in New Zealand in the 10th to 14th centuries (Reed, 1970: 23) have considered the rock lobster to be culturally important. When commercial harvesting occurred, it varied regionally and was often characterized by a classic pattern of boom and bust (Figure 2). In 1937, regulation was introduced and mandated a variety of bureaucracy-based techniques: licensing, method restrictions, and limited entry. Throughout the approximately fifty year regulatory period, until the introduction of QMS, fishers held a very limited bundle of property rights, typically consisting of access rights and limited (often poorly defined) withdrawal rights.

Permitted fishing & catch restrictions: 1937–1980

According to Annala (1983a), regulation began in 1937 with the introduction of permitted fishing (license requirements) and a variety of mandatory input controls and method restrictions. Concerns about the permitted fishing approach arose in the 1970s, when a rapid decline in stock abundance led to concerns about over-fishing and stock collapse (Figure 2). The New Zealand Federation of Commercial Fishermen,⁶ the Fishing Industry Board,⁷ and the Ministry of Agriculture and Fisheries agreed to restrict the number of rock lobster fishing vessels more tightly. In 1977, a moratorium on issuing new fishing permits was imposed and remained in place until 1980. Meanwhile, the Ministry and industry held a series of public meetings to decide how to manage the fishery. In addition, the Fishing Industry Board surveyed rock lobster fishers to assess their opinions of management options (Annala, 1983b). As a result, a controlled fishery was introduced in 1980.

Rock lobster as a controlled fishery: 1980–1990

As part of a “controlled fishery,” rock lobster fishing licenses and vessel authorities were non-transferable and restricted to permit holders who earned at least 80% of their income from fishing or fishing-related activities. As a result, the number of commercial lobster fishers initially dropped 38% and then continued to decline through natural attrition (Annala, 1983a: 107). The controlled fishery also divided New Zealand into nine separate geographically

⁶ The New Zealand Federation of Commercial Fishermen is an association primarily composed of small-scale, predominantly inshore fishers who typically own their vessels, catch, then sell on to the larger processors.

⁷ The Fishing Industry Board (FIB) acted in an advisory and advocacy role for the industry. It was empowered by the government to levy the industry to pay for its activities. In 1997, the FIB was replaced by the New Zealand Seafood Industry Council (SeaFIC) which assumed levying authority but has a different organizational structure.

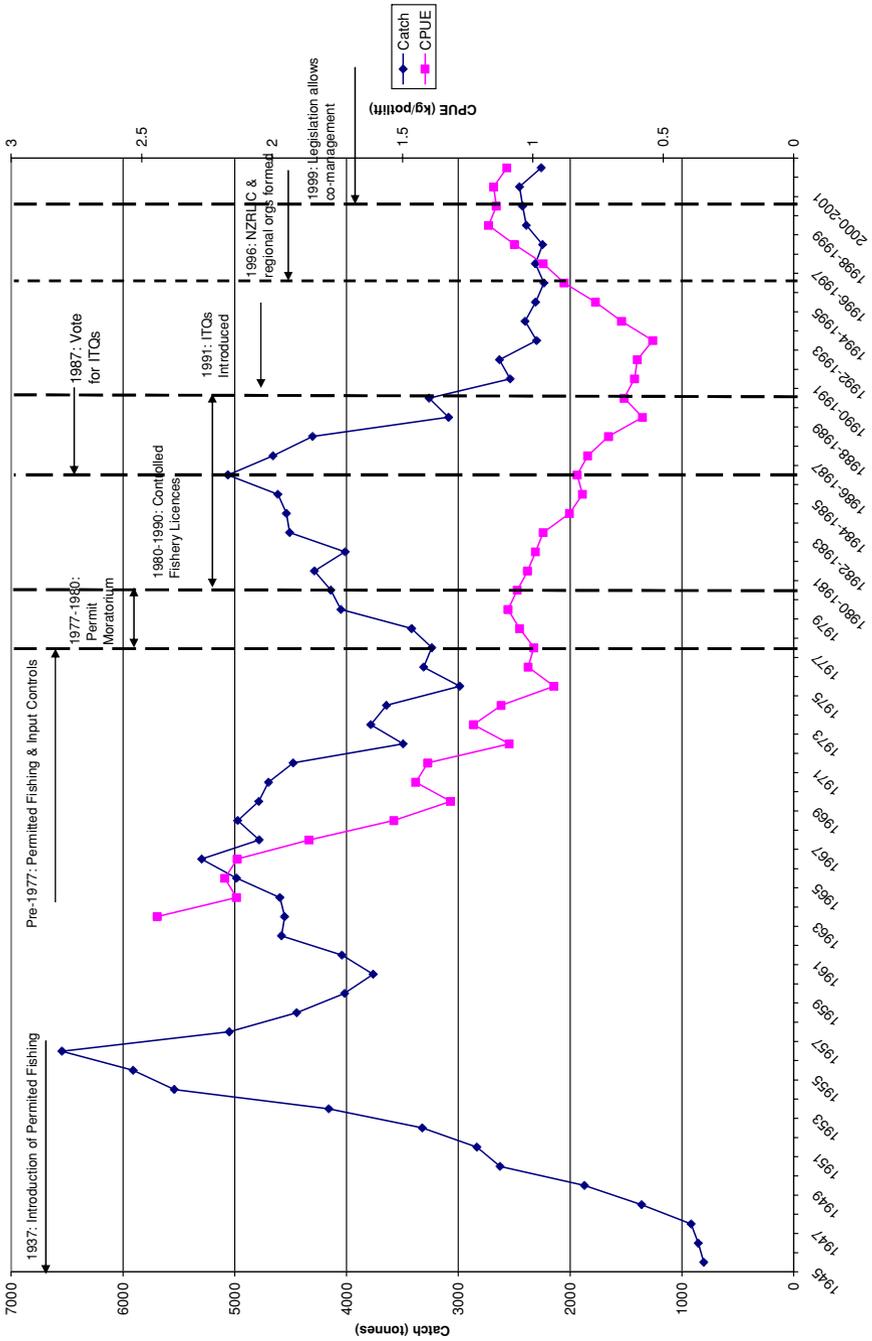


Fig. 2 Historical catch and catch per unit of effort (CPUE) for New Zealand rock lobster.

distinct fisheries, with permits usually restricted to one region. For each region, the Fishing Industry Board organized a liaison committee consisting of fishers and processors who provided industry input into regional fishery management. A national liaison committee was also created. The formation of these committees was a key step towards the development of co-management because it institutionalized fisher input at the regional and national level. The current CRAMAC/NZ RLIC structure mirrors these liaison committees.

Introduction of rock lobster into the quota management system

While rock lobster continued under controlled fishery management until 1990, the 1980s saw great change in the broader New Zealand fishing industry. In 1986, New Zealand became one of the first countries to adopt market-based fisheries regulation when it instituted its Quota Management System (QMS) (Crothers, 1988; Annala, 1996). This approach (with its emphasis on the use of ITQs, the removal of subsidies, and the promotion of exports) is a long-standing example of the market-based approach to natural resource management.⁸ The introduction of ITQs was important because it marked the first time that the fishing industry was subject to limits on total catches. Underpinning this new regime was the re-allocation of property rights from the government to the industry.

However, rock lobster was not included in the initial roll-out of QMS. In early/mid 1980s, the Ministry approached the New Zealand Federation of Commercial Fishermen about using the rock lobster as a pilot species. The membership rejected the proposal because the fishery appeared healthy and because fishermen were wary of any system entailing a catch limit. Thus, QMS was first introduced in fin-fisheries and paua. This left the rock lobster fishery with access rights and limited withdrawal rights while fishers in other fisheries held access rights, defined withdrawal rights, and limited exclusion rights.

Then, as pressure on rock lobster stocks grew, the issue of bringing the species into QMS was re-examined (Sykes, 2003; Branson, 2005). The discussion of how and under what circumstances rock lobster could be brought into QMS first took place between government officials and industry leaders (Duncan, 1985). They considered four management options: the existing system, transferable licenses, transferable pot entitlements, and ITQ management. Then the discussion moved to the grassroots level (MAF, 1986a). After a series of public meetings, a ballot of the rock lobster fishers showed no policy option receiving majority support, and ITQ management receiving only 21% support (Branson, 1986).

In the wake of this vote, there was a new round of consultation. However, the Ministry limited options to a revised ITQ management system under QMS or the existing controlled fishery (MAF, 1986b). ITQ management was clearly not popular among rock lobster fishers. Acceptance required two ballots, and on the second, the two most popular options (transferable licenses and pot limits) from the first vote were removed. The Minister justified the removal thus: “Transferable licenses and pot limits are considered to have major shortcomings. . . . [I]mplementation of either of these options would not be in the long term interests of the industry or the nation” (MAF, 1986b: 4). The Minister hinted at an ultimatum stating: “If after a second round . . . substantial opposition to ITQs still exists, then I believe there will be no alternative but to maintain the present controlled fishery regime and to set a TAC for each controlled fishery” (MAF, 1986b: 4). In other words, if ITQs were not approved, the rock lobster industry would face the worst of both worlds with total catch limits supplementing the

⁸ For a full discussion of the implementation and effects of QMS, see Annala, 1996; Boyd and Dewees, 1992; Yandle and Dewees, 2003.

existing management system. With the two most popular options removed, 71% of votes in the second ballot were in favor of ITQs (Jarman, 1987). Reflecting upon that decision, Sykes (2003) commented “we came into QMS reluctantly . . . as we got closer to 1990, there was grudging acceptance that ITQs were going to happen and we needed to get into a negotiation with Government to get the best deal possible for the incumbent fishermen.” Rock lobster entered QMS in April 1990.

This manner of introducing QMS can be viewed as a clear instance of the Government directly over-riding the desires of industry. However, this does not mean it was a unilateral action. During the process, consultation and two votes occurred, and the rock lobster industry appears to have made a collective decision to negotiate an optimal outcome rather than to accept an ultimatum. This also marked the expansion of the bundle of property rights that rock lobster fishers held to include access, defined withdrawal, and limited exclusion rights.

Rock lobster under the quota management system

Although the introduction of rock lobster into QMS began a period of relative legislative stability, turbulence continued within the regulatory setting. These events, briefly summarized below, were important for developing industry’s role in policymaking, and thus for their role in developing a co-management tradition. This evolution in the relationship between industry and government also illustrates a gradual growth of industry-held property rights, followed by the industry demanding – and eventually received – greater management rights.

Management advice and initiatives

Industry was involved in rock lobster management at the national level through two different initiatives. The first was the Rock Lobster Steering Committee (RLSC) whose members represented commercial and recreational interests, Maori interests, conservation groups, and the Ministry of Agriculture and Fisheries. The RLSC was convened in 1991 to develop a ten-year management plan for the fishery, and it represented a “shift towards a new management approach based on the direct involvement of user interests in the formulation of a forward looking fishery plan” (RLSC, 1991: i). After an intensive consultation period, the RLSC recommended that management should be regionally focused and should use, in addition to the existing TACC limits, a variety of approaches (e.g., crackdowns on illegal fishing, handling protocols, size requirements). Finally, the committee recommended that management approaches be regarded as evolutionary, and that a National Rock Lobster Management Group (NRLMG) with a composition similar to the RLSC be created (RLSC, 1991). Thus in 1992, the NRLMG was established, and it continues today.⁹ Over the past decade, the NRLMG has changed its role from a provider of management advice to that of a multi-sector user/stakeholder group forum engaged in policy-making.¹⁰ Since the group

⁹ Its official composition includes all the groups that participated in the RLSC. However, the participation of the environmental representative is not consistent, and in 2001 concerns were raised about the lack of direct Maori representation on it.

¹⁰ This change is documented in the following two statements: “The group first met on 31 July 1992 and agreed their purpose was to provide you [the Minister] with ongoing advice relating to the management of the rock lobster fishery from a group that is representative of all interests in the fishery.” (NRLMG, 1993; 3). While

retains its position as primary management adviser to the Minister, this change strengthened the role of regional and national organizations in developing management approaches. In this change, the NRLMG's role evolved from consultative to more collaborative interaction with the Ministry. This, combined with other events described below, was part of a broad shift toward co-management.

In addition to participating in policy making through the RLSC and NRLMG, the rock lobster industry engaged in a series of efforts to manage the rock lobster stock. While the industry's efforts were not always successful, these efforts provided an opportunity for the industry and government to gain experience working together, building skills and experience for what became co-management. Some initiatives are summarized below.

- *Supplemental Enforcement Initiative*: In 1993, at the instigation of the rock lobster industry, the Ministry and the Fishing Industry Board contracted for the Ministry to provide additional law enforcement to target illegal fishing in both the commercial and non-commercial fisheries. While initial reviews in 1994 were positive (FIB, 1994), the agreement rapidly fell apart after a Ministry legal review deemed the contract inappropriate. Industry groups also expressed frustration with the Ministry's lack of progress (FIB, 1996).
- *CRA 3 Harvest Strategy*: In the early 1990s, the CRA 3 stock was in significant decline. Commercial fishers worked with recreational and customary Maori interests to form the CRA 3 Users Group and to develop an innovative harvest strategy:

We initiated meetings with customary Maori and recreational fishers . . . After a few tense meetings; we realized that we all wanted the same thing. . . . It was an instant success, but that was largely because the economics of fishing were improving. We didn't have to catch so much to make a good income. Halley (2005)

With some modification, the Ministry accepted the harvest strategy, and elements of it remain in place today. While CRA 3 leadership now expresses concerns over the long-term success of the plan, it remains widely regarded as an important event that built momentum for co-management.

- *Data Gathering Programs*: Stock monitoring data are a key component of rock lobster stock assessments. The rock lobster industry has progressively developed and implemented stock monitoring initiatives such as logbook programs and electronic data collection and reporting programs. The CRA 2 industry commissioned and funded an extensive lobster tag and release program in 1996. The CRA 5 industry established a research committee that not only initiated commercial logbook programs and tag and release programs, and worked with the charter sector to develop a charter logbook program (Wichman, 2004).
- *No Tag/No Sale*: An ongoing problem is illegally caught lobster sold to the retail and hospitality trade. In New South Wales, Australia, a tagging program was used to identify legally caught lobster available for sale. In conjunction with the Fishing Industry Board, the New Zealand rock lobster industry experimented with a similar program. However, the program was purely voluntary. The program failed for multiple reasons including: resistance from retailers, consumers, and restaurants (which had benefited from the lower prices on the black market); technical difficulties with the tags, and the lack of an enforceable regulatory framework. The program was shelved after its 1999 trial (Sykes, 2003).

in 2002 the following statement emerged "The NRLMG has not only played an important role in developing a significant level of consensus among user groups, which aids in the decision-making process, but also has encouraged the development of management initiatives throughout the country." (NRLMG, 2002: 6).

These examples show a pattern at the national and regional levels of the rock lobster industry having taken on management responsibilities over an extended time period and building experience and expertise through the process. While these efforts had mixed success, they showed a consistent pattern of industry involvement in, and often initiation of, innovative management practices.

Development of the New Zealand Rock Lobster Industry Council

During the mid-1990s, there were efforts to formalize and institutionalize the industry's role in management. As regional groups took on more responsibility and formed or revitalized formal organizations, the need for national coordination rapidly grew beyond what the Fishing Industry Board could provide (Sykes, 2003). In 1996, a series of meetings took place eventuated in the creation of the New Zealand Rock Lobster Industry Council (NZ RLIC) and its associated regional groups (or CRAMACs). Thus, the NZ RLIC became one of the first Commercial Stakeholder Organizations (CSO) in New Zealand. A final key development took place in 1997 when stock assessment research contracts became contestable (i.e., open to competitive bidding) therefore superseding the previous closed system between the Ministry and the National Institute of Water and Atmospheric (NIWA). The NZ RLIC formed a consortium with the Seafood Industry Council (SeaFIC) and NIWA. The consortium won a one year contract as a result of which industry and government scientists worked together and had extensive access to fishing boats. This contract marked the first time that commercial interests acted as research service providers, as well as regulated entities – and thus more significant roles in management. The consortium now regularly receives multi-year contracts and uses independent service providers and CRAMACs as subcontractors (Sykes, 2003).

At the same time, similar movements toward co-management took place in the entire fishing industry. As fishing organizations took on more management responsibilities, the seafood industry sunset the existing Fishing Industry Board in 1997 and replaced it with the New Zealand Seafood Industry Council (SeaFIC), whose shares were owned by the CSOs.¹¹ Institutional structures to support the developing co-management regime arose along with increased participation by both the rock lobster fishery and the broader seafood industry. The NZ RLIC, the CRAMACs, and SeaFIC all developed to support the regional (and in the case of SeaFIC, national) organizations that were sharing more management responsibility with the government.

Today, there are three layers of industry organizations supporting co-management (See Figure 3). Within the rock lobster industry, the first layer is composed of the nine CRAMACs or regional organizations that address region-specific issues and often provide on-the-ground implementation for programs such as stock assessments or logbook programs. These groups interact with each other, as well as the NZ RLIC. The NZ RLIC in turn both provides technical support for the CRAMACs and works on national-level issues. CSOs such as the NZ RLIC vary in their structure. Like the NZ RLIC, a few are national with nested regional organizations within them; others are national organizations without nesting; and still others are simply regional organizations. There are 28 CSOs that form the voting membership of SeaFIC. Voting is based on “the levy collected for each stock represented by each CSO” (SeaFIC,

¹¹ SeaFIC was established as a company in which shares are owned by CSOs. Shareholders elect a Board of Directors which has oversight of the implementation of agreed work plans and budgets.

2005: 2). In addition, there are four other industry special interest organizations¹² that retain membership in SeaFIC, but in a non-voting capacity. SeaFIC provides representation on generic issues affecting the entire industry, and it provides services such as assistance in stock assessment and scientific research, communication within the industry, and administration of QMS.

Legal recognition of commercial stakeholder organizations

In September 1999, the 1999 Fisheries Amendment Act was passed to support this movement toward CSOs and co-management. The Act delegated certain management responsibilities to “approved service delivery organizations,” or CSOs. The explanatory notes accompanying the legislation described the extent of power sharing:

Another major reform will allow the Minister to transfer responsibility for certain fisheries services to quota owner-based organizations . . . In devolving responsibility, the . . . Ministry will no longer be responsible for delivery of those fishery services but will take on a role of monitoring and auditing the performance of approved service delivery organizations . . .” (Fisheries Act, 1996; Amendment Bill, 1999)

Furthermore, the legislation notes that the Ministry must be satisfied that “The proposed approved service delivery organization is representative of quota owners who have an interest in those functions, duties and powers” (Fisheries Act, 1996; Amendment Bill, 1999: Section 296(B) 3a).

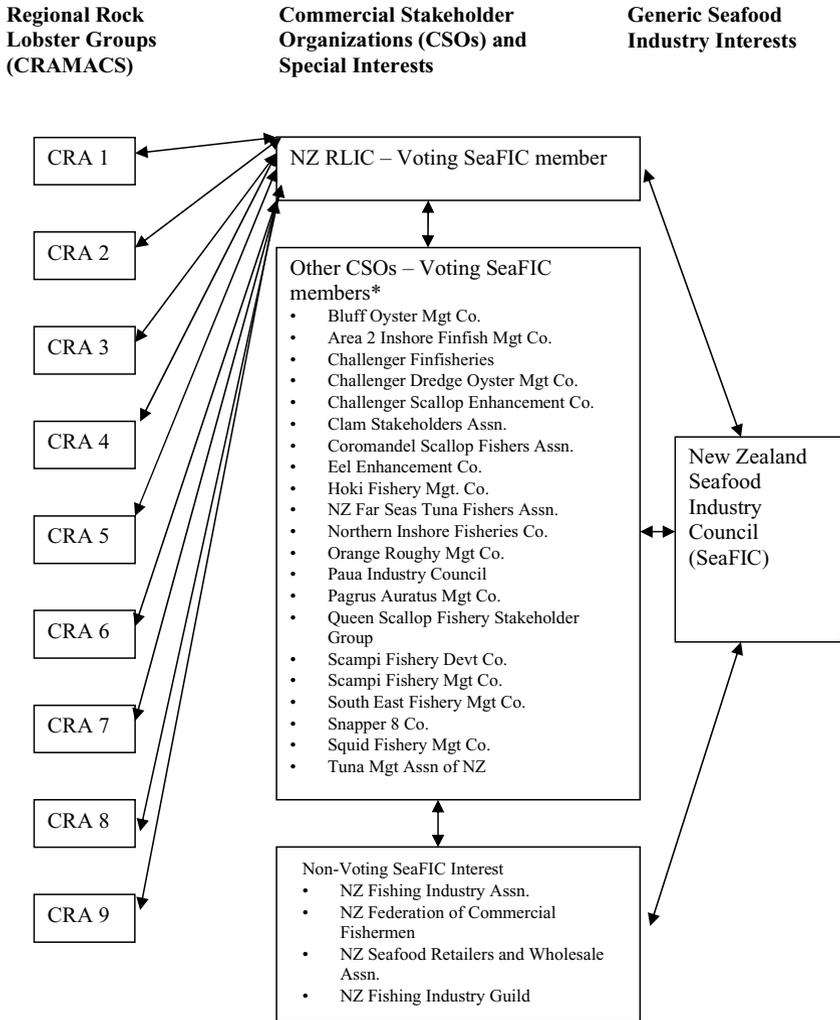
Essentially, CSOs may carry out routine management activities, including research, while the Ministry maintains the role of setting and enforcing minimum management standards (but not all management goals), and of auditing CSO activities. Thus, this legislation expanded property rights in the rock lobster industry (as well as in other fisheries) by evolving from industry holding some de-facto limited management rights to it holding legally recognized (de jure) limited management rights. Subsequent changes in government leadership and other factors has since slowed the efforts of many CSOs, but the 1999 legislation provided the legal framework for the considerable co-management efforts that arose within the rock lobster industry and other New Zealand seafood sectors.

Evolutionary development of co-management from an informal to formal regime

There are multiple linked explanations for the development of co-management in the rock lobster industry. Below, evidence for each explanation is discussed in turn. These explanations are: a strong tradition among rock lobster fishers of involvement in fishery management or governance that progressed over several decades from an informal to a formal management structure; growth in the perceived property rights of the broader New Zealand fishing industry; and the political context within which these developments could occur.

As the narrative above illustrates, within the rock lobster industry there was a tradition of involvement and participation in the fishery beyond just catching fish. Although participation was often informal, there was the expectation of having input or participation in

¹²These organizations are: the New Zealand Federation of Commercial Fishermen (representing small, independent fishers), the New Zealand Fishing Industry Association (representing larger corporate interests and vessel owners); the New Zealand Fishing Industry Guild (representing unionized fishers working on large vessels); and the New Zealand Seafood Retailers and Wholesalers Association (representing marketing interests).



* Recent industry developments (since the release of SeaFIC, 2005 in September 2005) have resulted in the amalgamation of multiple CSOs (e.g., Hoki Fishery Mgt. Co. and Orange Roughy Mgt Co.; Northern Inshore Fisheries Co. Snapper 8 Co. and Pagrus Auratus Mgt. Co.). However, as the process is not yet complete, CSO organization is presented as it was in September, 2005.

Fig. 3 Structure of rock lobster and seafood industry organizations (developed from information in SeaFIC, 2005; Sykes, 2003)

management through institutions such as port associations, lobster syndicates, and liaison committees. The events of the last few decades have shown a pattern of fishers and industry consistently increasing and formalizing their participation in resource management and governance activities. This evolutionary accumulation of expertise and experience encouraged the gradual emergence of the CRAMACs and the NZ RLIC as institutions capable of co-managing with government.

Growth of property rights

But why was it worthwhile for individuals and groups to invest the time, effort, and money to build this approach? The answer is found in the context of property rights. In the case of the New Zealand rock lobster, property rights grew in the form of changing perceptions of what ITQs represented. Ostrom and Schlager's (1996) typology of property rights (discussed above) allows us to track the growth of property rights concurrent with the evolution of co-management. Under the controlled fishery before QMS (see Table 3) fishers had access and withdrawal rights, although withdrawal rights were poorly defined. When QMS was introduced to the finfish fisheries in 1986, ITQs represented the right to extract a specified tonnage of fish from the national fisheries. Thus, fishers had access and well-defined withdrawal rights, as well as limited exclusion rights in the ability to sell and lease ITQs. Over time, the property right that ITQs represent has changed, growing to embody a more extensive bundle of rights.

The strengthening of property rights coincided with events in the development of rock lobster co-management. This was a mutually supportive process in which strengthening property rights and engagement in management re-enforced each other over time. Gradually, more fishers gathered more pieces of the property rights bundle – either formally or de facto. That continued until, in the late 1990s, the rights of the fishers reached the critical level described in property rights theory, namely the level at which the fishers had access, withdrawal, management rights shared with the government, and limited exclusion rights. This resulted in the still evolving co-management approach that one sees today in the CRAMACs and the NZ RLIC. Similar results can also be seen in other CSOs and the broader fishing industry (Yandle, 2003).

Political context

Developments, such as the adoption of ITQs and co-management, do not occur in a vacuum: “policy instruments are not politically neutral, and the selection of one instrument or another for a policy intervention will generate political activity and have political consequences” (Peters, 2002: 552) A detailed examination of the political context and process that took place in the adoption of ITQ management and co-management is beyond the scope of this study. However, one can say that adoption of ITQ management (for the general finfisheries in 1986 and for rock lobster in 1990) was part of a broader political context with its emphasis on moving away from tight prescriptive government regulation of the economy (Scott et al., 1997). In the move toward co-management, trends in fisheries were concurrent with the devolution of natural resource management away from central government, and towards local and regional government bodies (Kerr, 1998). Similar efforts to shift management responsibilities from central government to regional government or the private sector occurred in health (Hawkins, 1995), broadcasting, tertiary education, and basic scientific research (Easton, 1997). Fisheries management was a more extreme example of this pattern, but co-management fits within a broader effort of government to shed many of its sole management responsibilities. Thus, political context, the growth of property rights, and the evolutionary growth of the rock lobster industry's participation in management converged in the development of co-management.

Assessing New Zealand rock lobster co-management

In addition to understanding what co-management is and how it developed in the rock lobster industry, it is useful to assess its strengths and weaknesses using Ostrom's (1990) design

Table 3 Timeline of events influencing ITQs as property rights: 1986–2000

Event	Description	Influence on perception of property rights	Rights held by Rock lobster fishers (based on Ostrom and Schlager, 1996)
1980–1990: Controlled Fishery	Licences and vessel authorities required to fish	Rock lobster fishers have extremely limited property rights because the number of fishers is severely limited. Rights are non-transferable.	Access, Withdrawal (poorly defined)
1986: Fisheries Amendment Act	ITQs introduced in most fisheries (not Rock Lobster)	ITQs defined as a right to harvest a specific amount of fish, while government retains ownership	Access, withdrawal (poorly defined) – Rock lobster fishers observe effects of well-defined withdrawal rights and limited exclusion rights in other fisheries
1990: Rock Lobster Enters QMS	Rock lobster enters QMS	Fishers in rock lobster fishery have same rights and incentives as other New Zealand commercial fishers	Access, Withdrawal, Limited Exclusion ^a
1990: Switch from Tonnage to Proportional Allocation	Government stops entering market to change TACC.	ITQ owners bear the risks and benefits of changes in catch limits. Provides incentive to manage stock sustainably.	Access, Withdrawal, Limited Exclusion – Fishers begin demanding some management rights after bearing costs of management decisions
1992: Treaty of Waitangi Settlement	Maori granted 10% of allocated quota; plus half of Sealord Products; plus 20% of all future stocks brought into QMS.	Government's use of ITQs as partial settlement of Treaty of Waitangi claims increased perceived strength of ITQs as a property right.	Access, Withdrawal, Limited Exclusion – Confidence in ITQs as long-term property right grows – Fishers continue demanding some management rights

(Continued on next page)

Table 3 (Continued)

Event	Description	Influence on perception of property rights	Rights held by Rock lobster fishers (based on Ostrom and Schlager, 1996)
1994: Switch from resource rentals to cost recovery	Quota owners pay for part of the cost of management rather than a "rental fee" for fishing in New Zealand.	End of resource rentals symbolized reduced government property rights and increased ITQ owner property rights. Incentive structure of cost recovery encouraged quota owners' involvement in fisheries management.	Access, Withdrawal, Limited Exclusion – Fishers demand (and gradually receive over the next two years) limited amounts of de facto management rights
1996: Fisheries Amendment Act	More explicitly defined ITQs, encouraged loans on ITQs	Provided a more explicit definition of ITQs, created ACE, and encouraged loan financing (see above)	Access, Withdrawal, Limited Exclusion, de facto Limited Management
1999: Fisheries Amendment Act	Legislation allows MFish to delegate some management powers to CSOs.	Explicitly recognizes ITQ owners as having a legitimate fisheries management interest that can be exercised through stakeholder groups.	Access, Withdrawal, Limited Management, Limited Exclusion

^a Ostrom and Schlager (1996) argue that ITQs provide only access and withdrawal rights. However, there is considerable evidence in New Zealand that ITQ owners acted individually (and in some cases collectively) to use ITQ sales and leases to control who had access to the fishery. (E.g., ITQ owners refusing to lease quota to fishers who did not participate in certain management activities or who had a reputation for engaging in illegal behavior). Thus in this analysis limited exclusion rights are also attributed to ITQs.

principles. Ostrom's design principles were selected because they are shared by successful self-governing management regimes, and thus provide specialized criteria to assess the strength of an institutional arrangement, rather than traditional outputs or outcomes. These principles (see Table 4) are, clearly defined boundaries; congruence, collective choice, monitoring, graduated sanctions, conflict resolution, right to organize, and nested enterprises. The public policy analysis literature also offers various criteria for such an assessment (Salomon, 2002; Nagel, 2002; Schwartz and Mayne, 2005). This literature identifies three classic criteria in public policy analysis: effectiveness, efficiency, and equity (see Table 4; cf. Brewer and DeLeon, 1983).¹³ An important caveat to this assessment is that since this case has existed for a relatively short period of time, the analysis must, in some respects, be tentative. Furthermore, when one assesses co-management, it is important to examine the roles of both government and the private entities.

Design principles assessment

Design principles focus on the characteristics of the resource management institution rather than on the policy outcomes. Clearly defined boundaries are important because by defining who has the right to extract a particular resource and under what conditions, they can provide the incentives for fishers to engage in resource management. This characteristic is best rated as medium to high. ITQs define who has the right to catch how much fish and where regional quota management areas are (see Figure 1). But rock lobster fishing often involves fishing specific "grounds and these regional units are quite large. Since these spatial rights are not legally recognized, fishers are left vulnerable to encroachment by marine farms (aquaculture), marine reserves, or Mātaihai (customary Māori fishing reserves). Nested enterprises are also rated as medium to high. The NZ RLIC provides a national-level institution, and the CRAMACs provide regional institutions (and thus some nesting). However, local institutions nested within the CRAMACs are either informally organized or do not exist.

Congruence, or the matching of harvest rules to local conditions, is rated as medium. The reason is that while New Zealand fishing regulations focus primarily on national standards (e.g., the ITQ system), some regions engaged in activities to match rules to local conditions. These activities can be either comprehensive like the CRA 3 plan or informal efforts to shelve quota. Collective choice arrangements are rated as high, because CRAMAC voting rules usually allow all fishery participants to vote. However, at times some CRAMACs restrict voting to quota owners for specific issues. In addition, many CRAMACs operate informally by consensus.

Monitoring is complex to assess because individual CRAMACs monitor at significantly different levels. In addition, there are variations in the type of monitoring. Because of this variation, this design principle is best rated as high to low. Participation in the monitoring of fishery conditions varies tremendously between CRAMACs: some have high rates of fisher participation in logbooks, tagging, and other programs, while others have few fishers participating in modest programs. Furthermore, fishers and CRAMACs do not participate universally in formal programs to monitor activities of their fellow fishers, and no information is available about informal monitoring efforts. Government-based monitoring is centered on fisher activity, and is limited to ITQ management, as enforcement is more focused on poaching.

¹³ Brewer and DeLeon's (1983) fourth criterion, "adequacy" is not included because it focuses on service delivery which is not relevant to this case.

Table 4 Summary of New Zealand rock lobster co-management assessment

Design Principles/ Assessment Criteria	Definition	Strength of Co-Management regime (rated high – low)
Clearly Defined Boundaries	“Individuals or households who have rights to withdraw resource units from the CPR must be clearly defined, as must the boundaries of the CPR itself.” (Ostrom, 1990: 90)	Medium to High – Large regional areas are legally recognized and reflected in CRAMAC structure. “Fishing grounds” are informally recognized, but not legally protected. Lack of recognition of spatial rights has led to conflict.
Congruence	“Rules that restrict time, place, technology, and/or quantities of ... [harvest] ... are related to local conditions and to provision rules.” (Ostrom, 1990: 90)	Medium – Fisheries management law primarily focuses on national-level issues, some CRAMACs (e.g., CRA 3) have supplemented with additional harvest rules.
Collective Choice	“Most individuals affected by the operational rules can participate in modifying the operational rules.” (Ostrom, 1990: 90)	High – Each CRAMAC creates its own voting rules, usually allowing all participants to vote. Many informally use consensus.
Monitoring	“Monitors, who actively audit CPR conditions and appropriator activities, are accountable to the appropriators or are appropriators themselves.” (Ostrom, 1990: 90)	Varies by CRAMAC – Individuals in some CRAMACs actively monitor conditions, but monitoring of activity not widely apparent. Government focuses on monitoring ITQs and poaching.
Graduated Sanctions	“Appropriators who violate operational rules are likely to be assessed graduated sanctions by other appropriators, officials accountable to the appropriators, or both.” (Ostrom, 1990: 90)	Low – Industry organizations not involved in sanctioning, government sanctioning focuses on deterrence and on poaching.
Conflict Resolution Mechanisms	“Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials. (Ostrom, 1990: 90)	Medium – No formal mechanisms exist, but CRAMAC leaders report that they are informally engaged in this activity.
Right to Organize	“The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.” (Ostrom, 1990: 90)	High – Right to organize is legally recognized under the 1999 Fisheries Amendment Act.
Nested Enterprises	“Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.” (Ostrom, 1990: 90)	Medium to High – National (NZ RLIC) and regional (CRAMACs) nesting is strong. No formal local nesting organization, but sometimes exists informally.

(Continued on next page)

Table 4 (Continued)

Design Principles/ Assessment Criteria	Definition	Strength of Co-Management regime (rated high – low)
Effectiveness	“The extent to which an activity achieves its objectives. The effectiveness of a tool varies with the circumstance.” (Salamon, 2002: 23)	High – Although relatively new approach, objectives appear to be met.
Efficiency	“Efficiency balances results against costs. The most efficient tool may not be the most effective one, rather it is the one that achieves the optimum balance between benefits and costs” (Salamon, 2002: 23)	Medium – While costs (especially initial development costs) appear high, this is balanced against high effectiveness.
Equity	Distributive: “the distribution of benefits and costs is more or less even among all those eligible” (Salamon, 2002: 23) Redistributive: “channeling benefits disproportionately to those who lack them” (Salamon, 2002: 23) Communitative equity – Those who pay or contribute the most receive the greatest benefits (added by author)	Low – Benefits are distributed based on amount of ITQs owned. Low – Not an objective of the tool, because benefits accrue based on ITQ ownership. High – Approach in rock lobster is based on this understanding of equity.

In contrast, graduated sanctions are easily assessed as low. The reason is that legal sanctioning is the responsibility of the government, and the government focuses on deterrence, with a low probability of arrest, but with high penalties for conviction. Furthermore, government enforcement focuses primarily on poaching (the sale of catch by non-commercial fishers) which is widely seen as a more significant problem than commercial infractions. The right to organize is rated high, because co-management rights were clearly recognized and defined in the 1999 Fisheries Amendment Act. Finally, conflict resolution mechanisms are rated as medium. No formal mechanisms exist in the NZ RLIC or the CRAMACs, but CRAMAC leaders report in interviews that they spend considerable time informally engaging in this activity.

Public policy assessment

If the goal of natural resource management is a biologically and economically sustainable resource, then the effectiveness of co-management is high, as measured by catch or catch per unit effort (CPUE). Figure 2 presents both measures in correlation to the key events in the rock lobster fishery. Since QMS and the later development of co-management, catch levels have been reduced through TACC reductions from a modern high of 4,658 tonnes in the year before fishers voted to 2,633 tonnes the year ITQs started. Furthermore, CPUE increased from a near historic low of 0.61 kg per potlift in 1991 (when ITQs started) to a high of 1.17 kg per potlift, a CPUE not reached since the early 1970s. These trends indicate a stabilized stock and increased return for effort. Similarly, stock assessments are consistently reporting that the stocks are safely managed – given the degree of uncertainty surrounding recreational and illegal catch (NRLMG, 2002; MFish, 2004, 2005). Indeed in areas such as Regions 7 and 8, the catch limits are being increased for the first time since the introduction of ITQ management and co-management (RLIC, 2006; MFish, 2006). However, QMS and the development of co-management are so intertwined that it is difficult to separate the outcomes of QMS from those of co-management.

Efficiency is more difficult to assess. According to Salamon (2002: 23): “The most efficient tool may not be the most effective one, rather it is the one that achieves the optimum balance between benefits and costs.” We can deduce that from the government’s perspective, efficiency is high, particularly when co-management is compared with direct regulation. The reason for this is that many of the costs are partially or wholly shifted to the CSOs. This shifting of costs may be a significant element in explaining why some New Zealand fisheries choose not to participate actively in co-management. From a longer-term perspective, efficiency would be considered mixed: although there are high initial costs¹⁴ as the approach is developed, in the long run, costs should be lower as manageability improves.

Both types of equity typically defined in the literature, distributive and redistributive, are low. In New Zealand rock lobster co-management, benefits (in the form of increased catching allowances when TACC is increased) accrue to ITQ owners in proportion to the amount of ITQs owned. Thus, the individual or company that owns a large portion of the ITQs receives a larger benefit distribution on a tonnage basis than the individual or company that owns a small portion of ITQs or the individual who leases catching rights from ITQ owners. This means that benefits are distributed neither equally (the goal of distributive equity) nor to those who have the least (the goal of redistributive equity). Instead, rock lobster management (and

¹⁴E. g., creating social and physical infrastructure for co-management, hiring regional and national leaders, unpaid fishers’ participating in logbook programs, and attending regional and national meetings.

New Zealand fisheries management more broadly) appear to have adopted a different model of equity: those who pay or contribute the most by paying levies based on quota ownership reap the most benefits – what might be called “commutative equity.”¹⁵ Under this measure of equity, performance is high.

Assessing strengths and weaknesses

Policy performance criteria and design principles reveal a mixed pattern of strengths and weaknesses. The regime’s performances on traditional public policy criteria are mixed. Effectiveness is rated as high, which is a rarity for fisheries management. But efficiency is rated as medium, largely due to concerns over whether costs are dropping or are simply being shifted from government to industry. Finally equity may be rated as high or low, depending on what definition of equity one uses. However, unlike the design criteria (discussed below) there is no clear explanation for this pattern of mixed success.

In terms of design principles, the strengths of co-management are collective choice (in which participation in decision-making is high) and the right to organize (which is legally recognized). Monitoring can be viewed as a potential strength, since some CRAMACs are performing extremely well, which suggests that as the approach matures, other CRAMACs will follow this approach. Similarly, nested enterprises are a potential strength. In contrast, this regime did less well on some more sophisticated design principles. For example, neither government nor industry engages in graduated sanctioning, and there are considerable issues connected with congruence and conflict resolution mechanisms. This suggests that the weaknesses may be due in part to the relative newness of this co-management regime, so that as the regime matures, we may see improvement. This would fit with the evolutionary nature of some co-management regimes.

Evolution of co-management and property rights in an environmental policy context

The New Zealand rock lobster industry’s experience is a useful case for understanding the development and workings of co-management. Because it is a co-management regime with recent origins and a modernized industry in a well-developed public management regime, this case provides the opportunity to understand whether and how this co-management arrangement could be applied in other settings. The assessment above and the historical analysis allows us to draw conclusions about the importance of two different concepts: the evolutionary nature of building a co-management regime in a mature regulatory setting, and the importance of property rights in building and maintaining a co-management regime.

Evolution of a co-management regime

A paradox of this case is that it involves slow evolutionary development within a modern regulatory setting. Unlike the merging of traditional arrangements with modern policy discussed in the literature (Acheson and Taylor, 2001; Jentoft, 1989), participation in this management regime needed to be nurtured. New Zealand actively encouraged nation-level participation through organizations such as the RLSC and the NRLMG. As the historical analysis and Table 3 illustrate, this evolution was a long process that required considerable

¹⁵This term is based on the concept of commutative justice that aim at fairness in private exchange or at agreements with an emphasis on giving and taking that occur at a fair rate.

effort and engagement by both government and industry. In addition, encouraging grassroots-level management skills will be important to develop the next generation of national leaders and to ensure strong local participation and buy-in. While New Zealand's national policy has not yet explicitly done this, the NZ RLIC and the CRAMACs are fostering such grassroots participation.

Finally, as part of nurturing this regime, industry must be respected as a partner in management, and not be treated merely as a regulated entity or adversary. Just as public managers have grown to respect “bottom-up” knowledge and policy development within their organizations (Lipsky, 1980), governments also should look to the regulated community, namely the front-line resource users. In this case, initiatives such as data gathering, logbooks, and the CRA3 Harvest Strategy are examples of efforts that were successful in improving management. Fostering these underlying conditions will be more useful to sustained success than the rapid implementation of co-management organizations in a vacuum.

Evolution of property rights

Although supporting a regime through long-term evolution toward co-management is difficult, developing an appropriate property right is more difficult. As Table 3 and the associated discussion illustrate, this is a gradual and evolutionary process. In 1990, all parties struggled with the implications of making ITQs proportional; in 1994, the expansion of property rights associated with cost-recovery was challenging. Formally introducing a co-management regime in conjunction with either of these developments would have been extremely difficult and may have undermined the long-term integrity of the co-management regime.

Paradoxically, ITQs create one form of property rights, but they are not always the best tool for accomplishing the goal of co-management. There is even evidence that ITQs can weaken traditional long-lived management arrangements – particularly at the local level (Ostrom, 1990; McCay et al., 1998; Palsson and Helgason, 1996). If such traditional arrangements exist, tools other than ITQs may be more appropriate. But if ITQs are introduced in such a situation, care should be taken either to preserve the roles of the groups or to provide alternative roles so that their knowledge and participation are not lost.

Once a co-management regime is established, the need to refine and clarify definitions of property rights continues. In the case of the rock lobster, many issues of property rights definition remain. For example, ITQs encourage participation in management when most fishers hold the property rights (in the form of ITQs). However, if ITQs are held by one individual or company, and another individual leases the annual catching rights, the long-term incentives that drive many owner operators to be proactive in fisheries management may be reduced. Essentially, when the ownership right is separated from the catching right – as with ITQs and ACE – or when the owner of the right is no longer the user of the right, the implied duty of care and custodial attitude towards the resource is weakened (Sykes, 2003).

Similarly, when the whole rock lobster fishery is examined, there are differences in how well-defined property rights actually are. QMS creates rights that are well-defined in terms of quantity, but spatial issues (where catching may occur) are not so well defined. In contrast, customary Maori catching rights are well-defined spatially though the creation of mataitai reserves which define geographic areas where commercial fishing is prohibited, and non-commercial fishing is managed by traditional Maori methods. But the quantitative rights (the limits on how much can be taken) are not defined. Meanwhile, recreational fishers are politically powerful, but both spatial and quantitative rights are not well-specified within the existing legal framework. This makes it difficult for the commercial sector to justify

investment in management activities, such as scientific research or ITQ shelving, because they believe other sectors will receive substantially more benefit but not contribute to the costs.

These examples illustrate the importance of defining property rights carefully, and of linking property rights to the incentives to participate in management. Furthermore, these concerns (separation of property rights from catchers and dilution of management benefits) echo the concerns in the common pool resource literature over the importance of well defined property rights. Thus, when one develops a co-management regime, it is important to define the property rights of all stakeholders involved in a resource completely.

Conclusion

While co-management is a potentially powerful tool, it is not simple to develop or to implement. The development of the NZ RLIC and the CRAMACs was a multi-decade evolutionary process that involved the nurturing of management experience within the industry and a quite remarkable expansion of property rights within the New Zealand rock lobster industry. The combination of these factors in this case is important for both testing academic theory, and for providing a road map for future development.

Although one must be cautious in generalizing from a single case, some conclusions may be drawn about the evolutionary development of co-management and the importance of well-defined property rights. Both factors are vital to the successful development of a co-management regime in a mature regulatory setting; and both require long-term support, investment, and commitment from both the government and industry.¹⁶

More specifically, we should move beyond treating “property rights” and “evolutionary development” as broad concepts. Instead, careful analysis is required to best match the characteristics of the property rights bundle with the biological, social, and regulatory setting of the regime. This case illustrates the importance of three areas where the characteristics of the setting and the characteristics of the property rights need careful matching.

- The extent of the property rights shared should be matched with the institutional strength of those receiving the rights. By gradually increasing the industry’s bundle of property rights, a more resilient co-management regime evolved.
- The type of property rights exercised by various users should be complementary. By defining the commercial sector’s extraction rights primarily quantitatively, and the customary Maori’s extraction rights primarily spatially, the seeds were sown for future conflict.
- The incentives associated with property rights should match (or accrue to) the users of the property rights. When one individual or group owns the property rights and a different individual or group exercises the extraction portion of the rights (as is the case with ITQ owners and ACE holders) there is little long-term incentive for those exercising rights to participate in or comply with management efforts.

By carefully analyzing variables such as these during the evolution of co-management regimes, we can better match changing property rights bundles with the biological, social, and regulatory characteristics of the regime and increase the likelihood of developing strong, long-lived co-management regimes.

¹⁶We can gain confidence in these conclusions because they are broadly congruent with the literature on institutional development (Ostrom, 1990; Ostrom et al., 1994; Putnam, 1993).

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