# Marching Towards Leviathan, Embracing the Market, or Romancing the Commons:

## An Examination of Three Approaches to Fisheries Management

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**Abstract** The paper argues that three competing paradigms or approaches to fisheries management exist: (1) the traditional centralized bureaucratic model favoring government regulation; (2) a market-based model favoring individual transferable quotas (ITQs); and, (3) a community-based model advocating the self-regulation of fish stocks. Examining each institutional arrangement reveals the normative biases and preferences that lead to different policy objectives. It also demonstrates that the policy analysts subscribing to each approach tend to rely on a different set of policy instruments and institutional arrangements. After examining each paradigmatic approach to fisheries management, the paper then critiques the institutional analysis performed by policy analysts in the fisheries literature. The major critiques are that the literature often ignores the full range of transaction costs associated with developing and implementing fisheries policies. The paper then compares each approach in greater detail by examining the transaction costs associated with each institutional arrangement. The paper concludes with an examination of how each institutional arrangement satisfies some general criteria for assessing institutional performance. The central argument is that fisheries analysts need an improved understanding of the strengths and limitations of the three prevailing approaches to fisheries management. Moreover, a greater cross-fertilization of ideas and approaches is needed to bridge the gap between the three disjointed areas the fisheries literature.

**Key Words** Community-based management, environmental policy, fisheries management, fisheries regulation, implementation, individual transferable quotas, institutional analysis, market-based regulation, natural resources management, policy analysis

## Introduction

The world's fisheries are in poor shape. For example, "of the world's 15 major marine fishing regions, the catch in all but two has fallen; in four the catch has shrunk by more than 30% (Weber 1994a, 293)." Similarly, "eighteen fisheries have seen their productivity fall by more than 100,000 tons each. Together, these drops represent a fall of nearly 30 million tons or more

than one-third of the 1992 catch (Weber 1994b, 13)." Indeed, there are countless examples of startling declines in many of the world's major fisheries, particularly the highly valued fisheries for migratory species (e.g., tuna, swordfish, salmon, etc.) and groundfish (e.g., cod, haddock, pollock, flounder, sole, halibut, etc.).

So who is to blame for the condition of the world's fisheries? One could argue that no one is to blame. We are simply witnessing the final stages of the "tragedy of the commons" that Hardin (1968) warned about 30 years ago. The fishing industry is locked in an incentive structure that compels them to extract fish in an unsustainable manner. Eventually this leads to declining harvests and possibly the eventual collapse of a fishery. As Hardin (1968, 1,244) eloquently observed "ruin is the destination towards which all men rush, each pursuing his own interest in a society that believes in the freedom of the commons." Others may choose to blame the fishers or the industry for putting their own self-interests above society's and failing to take steps to prevent the decline in the worlds fisheries. At a minimum, it is fair to say that the prevailing incentive structures create a difficult collective action problem (Olson 1965).

Others might chose to blame the very 'Leviathan' created to prevent Hardin's (1968) tragedy of the commons. The presumption that an external Leviathan is necessary to prevent the tragedy of the commons has been around for at least 25 years and it has led to countless recommendations for strong centralized government control and management of natural resources (Ophuls 1973). Accordingly, in order to save the fish, governments enact rules and regulations to manage and control the actions of fishers (Charles 1992). The declining catches and precarious state of many of the worlds fisheries suggests that government could also be criticized for failing to have the political will or the capability of taking the necessary steps to protect and manage the world's fisheries.

One could also chose to blame the policies adopted by governments whether they be regulations or individual transferable quota (ITQ) systems restricting the harvesting of fisheries resources. After all, many of these policies arguably have been ineffective as evidenced by he declines in the world's fisheries. Some attribute these policy problems to bad science or the failure to take into account the interactions between fish stocks in large marine ecosystems (e.g., Alexander 1993; and, Sherman 1991). Others charge that the policies fail because they do not adequately change prevailing incentive structures (e.g., Clark, et al. 1988), they often promote inefficient fishing practices (Wilen 1995;and, Clark 1993), or they are inconsistent with prevailing community or societal values (McCay 1998; Hall-Arber and Finlayson 1997; and, Durrenberger, E. Paul. 1996). Clearly, there is plenty of blame to go around.

In this paper, we argue that the policy analysts involved in developing and implementing fisheries policy deserve at least a share of the blame. Our criticism is not with the bio-economic model that is often used to select the "best" policy. That model has received ample criticism elsewhere (e.g., Schlager 1990). Rather, our criticism lies with many policy analysts' failure to adequately examine the strengths and weaknesses of the institutional arrangements used to implement policies. A great deal of the fisheries literature treats institutional arrangements in overly simplified terms. As a result, their institutional analysis is often truncated and ignores the full range of costs and benefits associated with an institutional arrangement. The fisheries literature contains few examples of comparative institutional analyses (e.g., Symes and Crean

1995; Yves 1991; Ostrom 1990; and, Jentoft 1986). Moreover, most of the work only examines one type of institutional arrangement even though different arrangements can be used to achieve the same policy objectives depending on the policy setting.

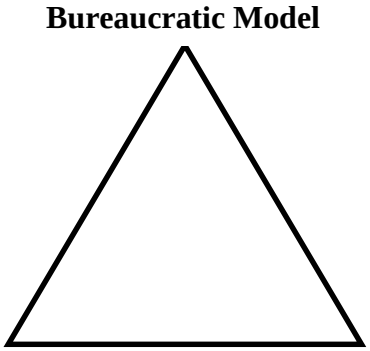
Compounding this problem is the fact that fisheries management is dominated by three general paradigms or approaches: (1) the traditional centralized bureaucratic model favors government regulation of gear, fishing time, locations, and catch; (2) the market-based model favors the use of individual transferable quotas (ITQs); and, (3) the community-based models advocates self-regulation or co-management of fish stocks (Charles 1992). All three models have their supporters and critics. Unfortunately, many policy analysts are advocates of one approach while a critic of the others. As a result, the analysis is often injected with clear normative biases and preferences which leads to different policy objectives. Each approach also tends to rely on a different set of policy instruments and institutional arrangements to implement their policy proposals. As a result, policy analysts subscribing to each approach are often overly critical of the positive aspects of the other approaches while at the same time often neglect to fully consider the limitations inherent in their own approach.

The objective of this paper is to compare and contrast these three paradigmatic approaches to fisheries management. The paper begins by examining each approach and the general arguments advanced by analysts subscribing to each model. This analysis reveals some of the normative biases and preferences of policy analysts in each area. It also helps to identify some of the interesting contradictions that can be found in the fisheries management literature. The paper then examines some of the problems with the institutional analysis done by fisheries analysts. Some of the major critiques are that the literature often ignores the full range of transaction costs associated with developing and implementing fisheries policies and that many analysts are guilty of faulty lesson drawing (Rose 1993). The paper then turns to the analysis of the relative merits of the institutional arrangements advocated by each approach. Specifically, the analysis compares each institutional arrangement in terms of the full range of transaction costs associated with developing and implementing the policies advocated by each approach. The institutional arrangements advocated by the three approaches are then compared using general criteria for assessing institutional performance. The paper concludes by arguing that fisheries policy analysts need to gain an improved understanding of the strengths and limitations of the three prevailing approaches to fisheries management. If this is to occur greater attention should be given to conducting comparative analysis of different institutional arrangements. Moreover, the paper argues that a greater cross-fertilization of ideas and approaches is necessary. Finally, the analysis argues that the lack of attention given to institutional analysis has left important research questions unexplored. The areas for future research suggested by this research are noted in the concluding section of the paper.

## Fisheries Management Paradigms

There are some that argue that the field of natural resource management is currently in the midst of a paradigm shift (Cortner and Moote 1994).[1] We choose to follow Charles (1992) and argue that the field of fisheries management is dominated by three competing paradigms or approaches to natural resource management: (1) the traditional centralized bureaucratic model; (2) the market-based model (e.g., ITQs); and, (3) a community-based model [Figure 1].[2] In this

**Figure 1: Approaches to Fisheries Management**




**Source**: Modified from Charles, Anthony T.. 1992. "Fisheries Conflicts: A Unified Framework." *Marine Policy* (September): 370 - 393.

paper, we start by exploring each paradigmatic approach. For the purposes of the discussion, each model is viewed as occupying one corner of the 'paradigmatic triangle' displayed in Figure 1. Charles (1992, 384) argues that many fishery conflicts reflect tensions between the three corners of this triangle. Extreme policy proposals and die-hard supporters would be seen as occupying one of the corners in the triangle. For the purposes of this paper, we will discuss the three competing approaches in terms of the corners of the triangle to better illustrate the typical arguments and policies advanced by their supporters. However, no implication should be made that all fisheries policy analysts can be neatly slotted into one of the three 'camps'. In fact, most analysts would likely place themselves somewhere in the middle (Charles 1992, 384). Instead, we argue that while most analysts may put themselves close to the middle, the policies they recommend often find themselves closer to one of the three corners.

Our discussion explores each approach by examining the general characteristics of each approach [Table 1] and their potential advantages and disadvantages [Table 2]. In the course of this exploration, it becomes clear that each approach has a unique set of normative biases and preferences that lead to different policy objectives. As a result, each approach tends to offer a different set of potential positive and negative outcomes. This leads to a disjointed literature in which each approach thrives within its own community of adherents, but is often criticized or ignored in others. The disjointed nature of the literature is further compounded by the lack of good comparative institutional analysis that examines the institutional arrangements advocated by each approach using a common set of evaluative criteria.

## Table 1: Characteristics of Each Paradigmatic Approach to Fisheries Management

| | Bureaucratic Model | Market-Based Model | Community-Based Model |
|---|---|---|---|
| **Primary Emphasis** | Stock protection and maintaining fisheries at sustainable levels | Wealth generation for the fishing industry | Community control over the fishery |
| **Competing Objectives** | - Conservation<br>- Resource maintenance<br>- Administrative efficiency<br>- Accountability | - Market efficiency<br>- Productivity<br>- Resource maintenance<br>- Accountability | - Fisher control<br>- Community welfare<br>- Distributional equity<br>- Other socio-cultural benefits |
| **Ownership of the Resource** | Government: Property rights held by the state | Fishers: Property rights allocated to the boat owners/fishers | Community: Property rights held by the community or a group of individuals within the community |
| **Fishers Are Viewed As** | Components of a fleet | Individual fishing firms | Members of a coastal community |
| **Characteristics of the Fleet** | - Overcapitalized seiners and trollers<br>- Individual boat ownership<br>- Labor intensive boats<br>- Inshore and offshore | - Modernized seiners and trollers<br>- Corporate boat ownership<br>- Capital intensive boats<br>- Inshore and offshore | - Small boats<br>- Individual, clan, tribal, or communal ownership of boats<br>- Labor intensive boats<br>- Predominantly inshore<br>- Native/small scale fisheries |
| **Policy Tools Advocated** | Focus is on regulating inputs:<br>- Licenses<br>- Gear restrictions<br>- Seasonal restrictions<br>- Closures<br>Other potential forms of government intervention<br>- Boat buy backs<br>- Technical assistance<br>- Research grants<br>- Loan Guarantees | Focus is on regulating the outputs using primarily ITQs<br>- % of TAC<br>- Tonnage | Mixture of inputs and outputs determined by self-regulation or co-management.<br>- Gear limits<br>- Seasonal restrictions<br>- Location restrictions<br>- Rotating pressure<br>- Ownership of fishing grounds<br>Social norms and consensus-building are important |
| **Types of Cheating Behavior** | - Illegal gear<br>- Fishing during closures or in closed areas<br>- Violating catch limitations<br>- Reporting false catch information | - Quota busting<br>- Discarding and high grading<br>- Off loading<br>- Leakage from monitoring system (e.g., reporting false catch information) | - Violating communal rules (e.g., gear limits, etc.)<br>- Outsiders violating the fishing rules |
| **Focus of Enforcement** | Fines or license revocation for violating rules for gear, closures, etc. | Fines or reduction/revocation of license for quota violations | Social sanctions for violations of communal behavioral norms |

## Table 2: Perceived Outcomes of Each Paradigmatic Approach to Fisheries Management

| | Bureaucratic Model | Market-Based Model | Community-Based Model |
|---|---|---|---|
| **Prerequisites for Success** | Rules must limit total catch so that the MSY is not exceeded | Quota must be set accurately so that the MSY is not exceeded and the market must be allowed to operate | Must have a community with shared rules that maintain the fishery at viable levels |
| **Potential Positive Outcomes** | - Centralized government control over resource allocation<br>- Resource protection<br>- Stability of the rules governing the fishery<br>- Low administrative costs to manage the fishery<br>- Public accountability with respect to the rules<br>- Equitable<br>- Preserve small fishers | - Economic efficiency and higher incomes for fishermen<br>- Eliminates capital stuffing and derbies<br>- Stock conservation by allocating quotas<br>- Accountability with respect to the quota<br>- Fleet/industry modernization<br>- Stability for fishermen and producers<br>- Develops corporativist culture<br>- Can create a new type of community based on market | - Locally managed<br>- Preserves community culture and values<br>- Preserves small-scale fishers/producers<br>- Rent-seeking behavior with respect to negotiating fishing rights is viewed in positive terms<br>- Often minimal environmental impacts |
| **Potential Negative Outcomes** | - Inefficient production<br>- Capital stuffing and derbies<br>- Overcapitalization<br>- By-catch can be wasted<br>- Incentives to cheat<br>- Lack of adaptability<br>- Agency capture by fishers, industry, or conservation groups<br>- Scientific uncertainty with respect to whether the regulations will prevent over-harvesting<br>- Administrative costs of monitoring and enforcement | - Equity problems<br>- Greater potential for environmental impacts<br>- Industry consolidation<br>- Incentives to cheat<br>- Rent-seeking behavior with respect to negotiating quotas is viewed in negative terms<br>- Loss of small fishers/producers<br>- Administrative costs of tracking quota allocations and setting new quotas<br>- Loss of community<br>- Agency capture by fishing industry<br>- Scientific uncertainty with respect to whether the quota has been set correctly | - No external accountability<br>- Economically inefficient<br>- Unsafe fishing practices<br>- Does not cope well with dramatic changes in technology, practices, stock, or culture<br>- Subject to capture by community leaders |
| **Supporters** | - Public administration<br>- Fisheries managers<br>- Many fisheries biologists<br>- Traditional natural resource management<br>- Individual fishermen, boat owners, small producers and distributors<br>- Conservation groups | - Resource economists<br>- Gaining favor with some fisheries managers and biologists<br>- Some institutionalists<br>- Corporate boat owners, large producers and distributors | - Anthropologists and sociologists<br>- Some advocates of adaptive management and ecosystem management<br>- Other institutionalists<br>- Fishers unions and cooperatives<br>- Those living in and involved with fishing communities<br>- Few fisheries managers |
| **Critics** | Nearly everybody including its supporters | Mainly advocates of the community-based model | Few real critics |

**Marching Towards Leviathan**

The assumption that an external Leviathan is necessary to prevent the tragedy of the commons has led to centralized government control and management of natural resource systems (Ostrom 1990, 9). Such is the case in the area of fisheries management where the bureaucratic model is historically the dominant approach to fisheries management, particularly in developed countries (Larkin 1977). The approach is "based on the premise that the primary duty of fishery management is to take care of the fish. Fishers are viewed, by and large, as components of a predatory fleet . . . To save the fish stock, fisheries management must directly control 'the fleet,' restricting fishing time, fishing location, total effort, and or harvest (Charles 1992, 384)."

What differentiates this approach [Tables 1 and 2] is that it typically represents the default position. For example, policy analysts do not write about the need for centralized state control over fisheries in the United States; a well-developed system of fisheries regulations currently exists (Wise 1991). Rather, analysts tend to examine the development and implementation of various fisheries management plans and regulations (e.g., Branson 1987; Cox 1988; Fullerton 1987; Miller 1987; and, Tucker, et al. 1997). Thus, the literature has an 'implementation' or 'policy studies' flavor to it.[3] Within the academic community, the bureaucratic approach finds support in the fields of public administration, planning, and traditional natural resource management. Many fisheries biologists are also supportive, as are many fisheries managers (e.g., Mace 1993). Many conservation groups also find themselves supporting the bureaucratic approach because they often have greater political influence over policy development and implementation. However, since it occupies the default position, the bureaucratic model is criticized by nearly everyone, including its supporters.[4]

Two representative examples of the bureaucratic approach are the Northwest Atlantic (the New England and Canadian) groundfish fishery. This region had a successful fishing industry for 300 to 400 years, until the introduction of more intensive harvesting techniques (such as trawlers) in the 1930s (Murawski et al. 1997). Since the earliest state intervention by the International Commission of the Northwest Atlantic Fisheries (ICNAF) which lasted from 1950-1977, the bureaucratic model has been the dominant approach to fisheries management (Halliday and Pinhorn 1997). After the Magnuson Fishery Conservation and Management Act was adopted by the U.S. in 1976 and the ICNF was disbanded, the two countries developed somewhat different approaches to fisheries management. The United States adopted a series of regional fisheries management councils that are charged with developing fisheries management plans and regulations that are designed to meet the federal goals of achieving "optimum yield".[5] By 1990, there were 32 active fishery management plans with over 150 amendments covering nearly 350 species of fish (Wise 1991).[6]

The Canadian system also followed a centralized bureaucratic model with the initial goal of "best use" and low exploitation (Doeringer and Terkla 1995). Later, the goals were changed to low exploitation and high employment. To reach these goals the Canadian government relies on direct management techniques such as limited entry, annual fishing plans, seasonal limits, and gear limits such as minimum net size. These programs can have high enforcement costs, which include shore-based, at-sea, and airborne surveillance. Sometimes the military is also used for enforcement against foreign vessels, and on-board observer coverage of foreign fishing is

basically 100% while it varies for domestic vessels from 100% in a few high-profile fisheries to almost nothing for small coastal vessels (Halliday and Pinhorn 1997, 100)."

In spite of these differences, all three systems (i.e., ICNAF, U.S. and Canada) share distinct similarities. All focus on conserving and maintaining fisheries resources at sustainable levels. The government holds the property rights to the fish. The government maintains strong centralized control over how the resource is allocated and helps to maintain public accountability with respect to resource allocation decisions. The regulatory systems are designed to be administratively efficient with similar rules and regulations governing a number of different species.[7] These rules often apply to all fishers in a similar fashion and tend to rely on a similar set of policy tools that govern the input (i.e., harvesting) component of the production equation. The typical policy instruments utilized in each system include: licenses; gear restrictions or prohibitions (e.g., trawls, mesh size, etc.); area closures; season closures; total allowable catches (Tacos); and, size limits. The rules are designed to be stable which helps improve accountability and lowers administrative costs. It also increases the equity in the system since similar rules apply to all fishers. Moreover, the stability of the rules can help to lower industry costs because it often has the effect of freezing or slowing industry change. This can help to preserve a role for small fishers and further enhances equity within the fishing industry. Finally, the open-access nature of the approach also helps preserve opportunities for small fishers and is consistent with the view of fishing as an individualistic enterprise.

However, one of the great strengths of the bureaucratic model, the uniform set of rules governing harvesting techniques, is also one of its great liabilities. Because the rules are designed to increase the level of effort required to harvest the resource, it decreases the production efficiency of the fishing industry. This can lead to overcapitalization of vessels, wasted effort, and creates derbies.[8] It also creates incentives to cheat by using illegal gear, violating size limits, fishing in closed areas, fishing during closed seasons violating catch limitations, misreporting catch information, and under-reporting catch (Halliday and Pinhorn 1997; and, Clark, et al. 1988). This increases the costs associated with enforcing these government regulations.

The stability of the rule system is also the source of potential problems. Because changing fisheries rules and developing new management plans can be a costly, time-consuming endeavor, the system's ability to adapt to changes in the fishery due to stock fluctuations, technologic changes, and changing social or economic conditions may be reduced. Moreover, Holling (1995, 1978) has also noted that rigid, centralized attempts to manage ecosystems often lead to their collapse in the long run.

Finally, it is important to note that bureaucracies suffer from a number of well-known problems. Bureaucracies and centralized decision-making arrangements can increase transaction costs because they often have trouble collecting and synthesizing information effectively. They can also suffer from information distortions. Developing the management plans and new regulations is a political process. This makes these agencies subject to capture by fishers, the fishing industry, or conservation groups and other forms of rent-seeking behavior (McManus 1994; and, Wilen 1995). Finally, bureaucracies and other centralized governance arrangements have been criticized because they have the tendency to: 1) become increasingly indiscriminate in

its response to diverse demands; 2) impose increasingly high costs on presumed beneficiaries; 3) fail to properly match supply with demand; 4) allow public goods to erode by failing to prevent one use from impacting others; 5) become increasingly error-prone and uncontrollable to the point where actions deviate from public purposes and objectives; and, 6) these problems can be compounded to the point that remedial actions actually exacerbate rather than ameliorate problems (V. Ostrom 1989, 56).

**Embracing the Market**

A couple of factors may have contributed to the emergence of the market-based model during the 1980s and 1990s.[9] Economic principles and concepts began to spread to a variety of academic disciplines, including natural resource management. This trend combined with the criticisms of the bureaucratic approach may have created an environment in which market-based approaches to fisheries management began to be viewed in more favorable terms.[10] As a result, a growing number of policy analysts began to advocate using a market-based approach to fisheries management instead of the bureaucratic approach.

Within the fisheries literature, two countries that have extensive experience with the market-based approach to fisheries management are New Zealand and Iceland. New Zealand adopted the approach in 1986 as a way to regulate and develop their newly declared 200-mile economic exclusion zone (EEZ). It was also viewed as an effective way to address the ongoing collapse of a few in-shore fisheries. Iceland's market-based system started in 1991 as a means of regulating and preventing over-fishing in an industry that was well-established with historic fishing communities. Of the two, New Zealand is usually presented as the "success story", while Iceland is usually the focus for negative evaluations. Other countries are also experimenting with ITQ systems including the United States (e.g., Buck 1995), Canada (e.g., Grafton 1997; and, Ostrom 1990), United Kingdom (e.g., Hatcher 1997), and Australia (e.g., Sanders and Beinssen 1997).

Based on the experience in these countries, it is possible to make some generalizations about the market-based approach. The primary emphasis of the approach is on improving the economic efficiency and productivity of the fishing industry (i.e., wealth generation) while at the same time protecting stocks at sustainable levels. The primary policy instrument is a tradable permit that is often referred to as individual tradable/transferable quota (ITQ). The ITQs are the result of a process in which regulatory authorities determine the total allowable catch (TAC) which is usually set at maximum sustained yield (MSY) for the fishery. The TAC is then allocated, usually in the form of tonnage or percentage of the TAC. Thus, the property rights to the fish are in effect transferred from government to the fishermen. Individuals and groups are then free to trade the permits among themselves in (theoretically) the most efficient manner (Kneese and Schultze 1975). Basically, the market-based approach views fishers as individual fishing firms that wish to maximize their returns on their investments (Charles 1992). Accordingly, while the bureaucratic approach focuses on the input side of the production process, the market-based approach tends to focus on outputs. Not surprisingly, the approach has been embraced within the resource economics community. The approach is also gaining some favor with fisheries biologists and managers. The approach also tends to find support in

the corporate fishing industry and many of the larger processors. Its biggest critics tend to be supporters of the community-based model (Charles 1992).

Fisheries analysts have advanced a number of arguments in support of the market-based approach. A number of positive outcomes have also been noted. Foremost are the emphasis on economic efficiency and the higher incomes for fishers and the industry as a whole (e.g., Scott 1955; Kneese and Schultze 1975; Clark, et al. 1988; Clark 1993, 1994; and, Grafton 1996). This can help to modernize the industry (e.g., Clark, et al. 1988; and, Grafton 1996) and lead to the development of a corporativist culture within the fishing industry. It can also help prevent the overcapitalization of the vessels (e.g., Buck 1995; and, Grafton 1996).[11] The ITQs can also help to eliminate derbies and their costly consequences and inefficiencies (e.g., Buck 1995).

Setting the TAC and allocating the ITQs has other advantages as well. It is perceived as an effective means for stock conservation since it sets a limit on the total harvest (e.g., Dewees 1989; and, Clark 1994). The system is also very adaptable from the standpoint that the TAC is often set on a yearly or seasonal basis. Accordingly, adjustments can be made to account for dramatic changes in the stock or other unforeseen circumstances (e.g., Squires, et al.1995). It also provides the industry with a sense of stability in that setting the TAC allows both fishers and processors to make better operational decisions and investments (e.g., Clark 1994). To the extent that the process of setting the TAC and the allocation of the ITQs is transparent, this approach can also enjoy a high degree of public accountability.

However, these positive outcomes are accompanied by rather a lengthy list of potential negative outcomes. It is also interesting to note that many of these problems are social issues ignored in the economics literature used to support the market-based approach. Others are simply the 'flip side' of the positive outcome and are described in negative terms by the supporters of the community-based model. Industry consolidation and the loss of small fishers are often viewed as a negative result of the market-based approach (e.g., Barber 1989; Young and McCay 1995; and, Palsson and Helgason 1996). Others point to social problems. Unemployment is often a negative by-product of an ITQ system (e.g., Squires, et al. 1995; and, Palsson and Helgason 1996). The move to corporate ownership can cause the wealth to be moved out of the local community (Palsson and Helgason 1996). The introduction of a market-based approach could lead to the loss of a sense of community and could damage existing local institutions (Ostrom 1990; Schlager 1990; and, Palsson and Helgason 1996). Some fishers may also get larger shares of the TAC and new entries (fishers) to the system are restricted (Palsson and Helgason 1996). Thus, ITQ systems can create important equity problems.

The strength of the market-based approach, setting and allocating the TAC, is the source of other problems. It doesn't reduce the incentives to cheat. Instead, it creates different forms of cheating behavior than are observed under the bureaucratic model. For example, fishers have incentives to cheat by high-grading their catch and other forms of quota busting (e.g., Schlager 1990; Palsson and Helgason 1996; Halliday and Pinhorn 1997; and, Turner 1997).[12] The model also relies heavily on having a sound understanding of the fishery's population dynamics. If the TAC is set incorrectly for several consecutive seasons, the fishery can be decimated in short order, perhaps before scientists have a chance to discover and correct the error. A good example of this was when the TAC for the Orange Roughy in New Zealand was set incorrectly because

scientists did not understand its life cycle. In this case, the MSY and corresponding quotas had to be scaled down by a factor of five to correct the problem (Mace 1993). Accordingly, scientific uncertainty can be an important problem confronting the implementation of a market-based management program (Mace 1993; and, Loayza 1994). Finally, setting and allocating the TAC can become a political process and this can be problematic when decisionmakers are confronted with scientific uncertainty. Accordingly, fisheries managers are subject to agency capture and other forms of rent-seeking behavior.

**Romancing the Commons**

The community-based approach also grew, to a large extent, during the last few decades out of frustration over the bureaucratic model and its market-based counterpart. The approach is more eclectic than its counterparts as well.[13] Its base of support is primarily in the fields of anthropology and sociology.[14] It also tends to get support from fishers unions and cooperatives. Those living in or involved with fishing communities also tend to be supportive. It is also important to note that there is often an advocacy element to this approach (Charles 1992). There is the tendency to 'romance the commons' and other communal values and to advocate protecting small fishers and traditional approaches to managing a fishery. Unlike the other approaches, however, there are few real critics of this approach. Possibly this is due to the fact that many of the "success stories" identified by supporters of the community-based approach take place in small fishing communities, often located in developing countries (e.g., Mantjoro 1996; and, Veitayaki 1998). Thus, it is possible that the fisheries analysts affiliated with the other approaches may not view this as a viable model for their circumstances.

The primary emphasis of this approach is on encouraging fishing communities to regulate themselves or to maintain current systems of self-regulation. Self-regulation refers to the social norms, rules, and sanctions for noncompliance that develop over time to ensure the continued sustainability of the resource (Ostrom 1990). The approach embraces the principle of subsidiary and argues that decisions affecting peoples' lives should be made at the lowest possible level (McCay and Jentoft 1996). The approach also focuses on maintaining "community welfare, distributional equity, and other social and cultural fishery benefits. An emphasis is placed on fishers as members of coastal communities rather than as components of a fleet … or as individualistic fishing firms (Charles 1992, 385)." In this model, the community (or a group of individuals within the community) holds *de facto* property rights to the fish. Over time the community works to develop a system of norms and social rules that allocate these fishing rights. Prevailing norms and cultural values often have a strong influence of the system of rules that develop. The rules can also take a variety of forms regulating either inputs or outputs. Common rules include gear limits, restrictions on effort, seasonal restrictions, and rotating positions on fishing grounds. Social sanctions are the primary enforcement tool.

Like the other two approaches, there are several potential positive outcomes associated with this approach. But these outcomes reveal a different set of goals: local control rather than centralized government control (Ostrom 1990; Hall-Arber and Finlayson 1997); the preservation of community culture and values (McCay 1998); internal accountability and reduced incentives to cheat (Ostrom 1990; Ostrom, et al. 1994); preservation of the small fishers by maintaining gear and effort restrictions; and, environmental preservation (McCay and Jentoft 1996). Given

the lack of critical attention that the community-based model has received, it is more difficult to identify potential negative outcomes. Perhaps the most well documented problem with this approach is that it is subject to capture by local leaders and this can lead to social inequalities (Davis and Bailey 1996). A closely related concern is that the absence of any central state control could create an absence of public accountability (even if it does have higher levels of internal accountability). Many of these systems are also economically inefficient and rely on primitive, labor intensive practices that can lead to unsafe working conditions and potentially dangerous fishing practices. There is also historic evidence such as the Northwest Atlantic groundfish collapse that this approach has difficulty adapting to dramatic changes in the fishery (such as technology, practices, or stock change) (Murawski, et al. 1997).

## Examining Institutional Arrangements for Fisheries Management

Based on the preceding discussion, it is clear that each paradigmatic approach has particular strengths and weaknesses. Analysts in each area also have clear normative biases and preferences that influence their analysis. Unfortunately, little comparative research has been done that examines the relative merits of the institutional arrangements advocated by policy analysts subscribing to each model. Complicating matters is the fact that a great deal of the institutional analysis done by fisheries policy analysts is truncated and fails to consider the full range of costs and benefits resulting from the implementation of these management programs. In this section, we explore some of the general problems with the institutional analysis that has been done in the fisheries literature.

### General Problems With Institutional Analysis in the Fisheries Literature

Institutional analysis in the fisheries literature suffers from two deficiencies. The first is justifying an institutional choice by dismissing other possible choices "after reciting a long parade of horribles (Komesar 1994, 6)." Essentially, the fisheries analyst lists the negative aspects of the competing institutional choices and uses them to bolster the case for their preferred institutional arrangement. The problem is that "[i]n a world of institutional alternatives that are both complex and imperfect, institutional choice by implication, simple intuition, or even long lists of imperfections is deeply inadequate (Komesar 1994, 6)." The less serious problem is what Komesar (1994, 6) calls the tendency towards "single institutionalism". The fisheries analyst focuses on examining the variation in performance of only a single type institutional arrangement. The problem with this approach is that it ignores the possibility that another institutional arrangement might be better at achieving the same policy objective. Thus, analysts who conduct a limited institutional analysis or treat it as an afterthought can draw inappropriate conclusions and provide bad advice to decisionmakers.

Much of the institutional analysis in the fisheries literature also suffers from what Rose (1993) would call faulty lesson drawing.[15] In other words, blindly assuming that a program that is effective in one fishery will work in other settings. Often a fisheries analyst will conduct a study of a particular set of regulations, an ITQ system, or a community-based management system and then argue that it should be adapted for use in other settings. The problem occurs when the analyst gives inadequate attention to the questions surrounding the program's fungibility. It also occurs when an analyst fails to give careful consideration to questions of

institutional design. Moreover, analysts must carefully examine the factors that could enhance or impede its use of the program in other settings if they are to provide sound advice to decisionmakers (Rose 1993).

As a result of these problems, many fisheries analysts examine the wrong question. They spend their time trying to determine which institutional arrangement is more effective in the abstract. In doing so, they are fundamentally asking the wrong question. Whether a particular institutional arrangement is good or bad in the abstract is irrelevant. Even if it is good, an alternative institutional arrangement may be even better. The correct question for the fisheries analysts to answer is which institutional arrangement will work best in a particular setting to achieve a specific set of policy objectives (Komesar 1994, 6). In other words, the analysts should be conducting a comparative institutional analysis.

When conducting a comparative institutional analysis, the analysts should consider a variety of factors. The first set of factors is the individuals or organizations that comprise what Ostrom (1990) calls the action arena. In this case, the action arena would be the fishery and the community affected by the rules created to govern the fishery. The full set of participants is likely to include the fishers, captains, and vessel owners, buyers, processors, distributors, regulators, and the community that these individuals live in, including those individuals and organizations that provide services to these actors. All of these parties can be affected by changes in the rules governing a fishery. Unfortunately, many analysts only focus on the relationship between the fisher and the regulator while neglecting other important actors. This can cause the analyst to ignore important policy impacts. As many community-based analysts point out, policy changes can have important affects on community welfare and be the source of conflicts surrounding fisheries proposals (Charles 1992).

The second set of factors address the physical setting and the nature of the resource management problem. To be effective, the rules governing a resource must be compatible with the underlying physical setting and the nature of the resource being managed (Ostrom, et al. 1994, 44). Since there is often considerable variation in terms of physical settings, the resource (i.e., species of fish), and the resource management problem, a search for one best rule for all situations is likely to be doomed to failure (Ostrom, et al. 1994, 237). For example, an institutional arrangement that is effective for managing groundfish might be less effective for managing migratory stocks. A community-based approach that is effective at managing nearshore fisheries may be less effective in monitoring offshore fisheries. Accordingly, when drawing lessons it is important for a fisheries analyst to consider how the physical setting, the resource, and the resource management problem can influence institutional performance.

A third set of factors is the attributes of the community where the fishery is located. The community-based approach is particularly concerned with this set of variables which include such things as generally accepted norms of behavior; level of common understanding about action arenas; homogeneity of individual preferences; and, the distribution of resources among the members of an action arena. The term “culture” is often applied to this bundle of variables (Ostrom, et al. 1994, 45). While the community-based approach is heavily focused on this set of factors, although often to the exclusion of the others, the other two approaches would be well served to address this set of factors in their analysis. For example, an ITQ system might work

well in a fishery that is heavily influenced by corporate ownership as is the case in the Pacific Northwest. However, in the North Atlantic there is a different culture within the fishing industry with considerable individual vessel ownership. It is less clear that a market-based approach based on limited entry would be effective or well received. Accordingly, cultural factors can play a role in fisheries conflicts (Charles 1992). Aspects of the local culture can also influence the development and implementation of rules governing a fishery (Ostrom 1990).

The final set of factors is the set of rules used to order relationships between individuals or organizations (Ostrom, et al. 1994, 37). There are several reasons why fisheries analysts should consider the existing institutional infrastructure before making new policy proposals. First, the government may lack the institutional capacity to implement the proposal. For example, many developing countries might have trouble implementing the U.S. system of fisheries regulations because they might lack the institutional or administrative capacity to monitor and enforce the regulations.

Second, the existing institutional arrangement can constrain your ability to address some problems. The longer a rule system stays in place and the more sophisticated and complex the rule becomes, the more likely it is that decisionmakers will encounter problems trying to make major changes to the rule system. For example, this might explain why ITQs were embraced in New Zealand and bitterly opposed in Iceland. The ITQ system in Iceland displaced preexisting institutional arrangements that had their supporters while in New Zealand there was no comparable set of institutional arrangements in place. Thus, the development of rules systems often has a path-dependent quality that can limit a decisionmakers ability to solve problems in the desired fashion. As a result, decisionmakers can only make minor "incremental" changes to the rule system because large-scale policy changes will encounter political opposition and dissent (Imperial 1999; Blomquist 1992; and, Ostrom 1990). It is important for fisheries analysts to understand that choices about policies and the institutional arrangements used to implement them can reduce the possibility of achieving an optimal solution if the solution exists in the space cut off early in the process of developing rules (Ostrom, et al. 1994, 325). Therefore, analysts should give careful consideration to how a proposed policy change might constrain future policy choices. Moreover, an interesting, but relatively unexplored, question is how this process of institutional development occurs. A greater understanding of this process is important because it would help fisheries analysts to develop more effective policy proposals that facilitate making the transitions from one system of regulation to another.

Finally, it is important for analysts to recognize that rules can enhance what one can do in the future. For example, once a system of fisheries regulations is established, one can build on this rule system to develop increasingly sophisticated regulations that address new resource management problems. Likewise, once an ITQ system becomes established, it can be expanded to other fisheries. As rule systems develop, they can also be used to address other social problems. For example, the ITQ system in New Zealand has been used to redress social impacts on the Maori and to protect their native rights to the fishery by allocating them a share of the TAC. Moreover, the longer a regulatory-based or ITQ-based system stays in place, the more likely that it will become part of the culture or create a new type of community that allows new opportunities for self-regulation to develop (Scott 1993).

## Examining Institutional Performance

Fisheries analysts must also take a wider view of how they measure institutional performance. It should be clear from the comparison of the three paradigmatic approaches that different policy objective and normative preferences are embedded in each perspective. This leads to very different ideas of what constitutes "success". Moreover, this is not a problem that is confined to the fisheries literature. In general, the implementation literature lacks any common criteria for success. For example, criteria commonly cited in the implementation literature include compliance (e.g., Mazmanian and Sabatier 1983), feasibility (e.g., Linder and Peters 1987), effectiveness (e.g., Lippincott and Stoker 1992), level of effort (e.g., Thompson and Scicchitano 1985), policy outputs (e.g., Ringquist 1993a), or policy outcomes (e.g., Rinquist 1993b).

Our view is that good institutional analysis examines performance from a variety of different perspectives. It is important for policy analysts to consider the full range of transaction costs and how they can influence institutional performance. Moreover, because of the multiple, and sometimes conflicting, policy objectives underlying a fisheries management program it is important to use a variety of criteria to evaluate the overall performance of the institutional arrangement. This type of analysis can help one better understand the relative merits of the different institutional arrangements used to implement fisheries policy. One approach to evaluating institutional performance that meets these requirements is the Institutional Analysis and Development (IAD) framework developed by Elinor Ostrom (1990, 1986) and her colleagues (e.g., Ostrom, et al. 1994; Ostrom, et al. 1993; Blomquist 1992; and, Kiser and Ostrom 1982) [Figure 2].[16] The IAD framework has been used to guide the analysis of individual and organizational relationships in a variety of settings and has proved to be useful in helping to analyze the institutional arrangements governing a wide range of common pool resources (CPRs) (e.g., groundwater, irrigation systems, forests, fisheries, etc.) in both developed and developing countries.

However, before using these criteria to make some additional comparisons between the three paradigmatic approaches to fisheries management, it is useful to briefly describe the IAD framework since the term "institutions" has taken on a variety of meanings in the public policy and organizational theory literature.

### *Institutional Analysis and the IAD Framework*

The IAD framework defines institutions as "enduring regularities of human action in situations structured by rules, norms, and shared strategies, as well as by the physical world. The rules, norms, and shared strategies are constituted and reconstituted by human interaction in frequently occurring or repetitive situations (Crawford and Ostrom 1995, 582)." Institutions include families, churches, local governments, government agencies, and most organizations since they are defined by rules, norms, and shared strategies (Ostrom, et al. 1993, 6). Institutions promote socially beneficial outcomes by helping actors resolve "social dilemmas" resulting when individually rational actions aggregate to produce socially irrational outcomes. Therefore, institutional arrangements provide the means to resolve collective action problems (Firmin-Sellers 1995, 203).

What differentiates institutional analysis from most forms of organizational analysis is the focus on rules. Rules are an implicit or explicit attempt to achieve order and predictability among humans (Ostrom 1986). Rules are prescriptions that forbid, permit, or require some action or outcome and the sanctions authorized if the rules are not allowed (Crawford and Ostrom 1995). Rules can be formal (e.g., laws, policies, regulations, etc.) or informal (e.g., social norms). Since "rules are not self -formulating, self-determining, or self-enforcing" (V. Ostrom 1980, 312), they are formulated in human language and subject to problems of lack of clarity, misunderstanding, and varied interpretations. The stability of rule-ordered interactions therefore depends upon the development of shared understanding of rules (Ostrom, et al. 1994, 40). This often requires building trust by monitoring and enforcing rules. Enforcement can take the form of formal (e.g., cease and desist order, civil penalties, criminal penalties, etc.) or informal (e.g., a verbal comments or facial expressions demonstrating displeasure) sanctions.

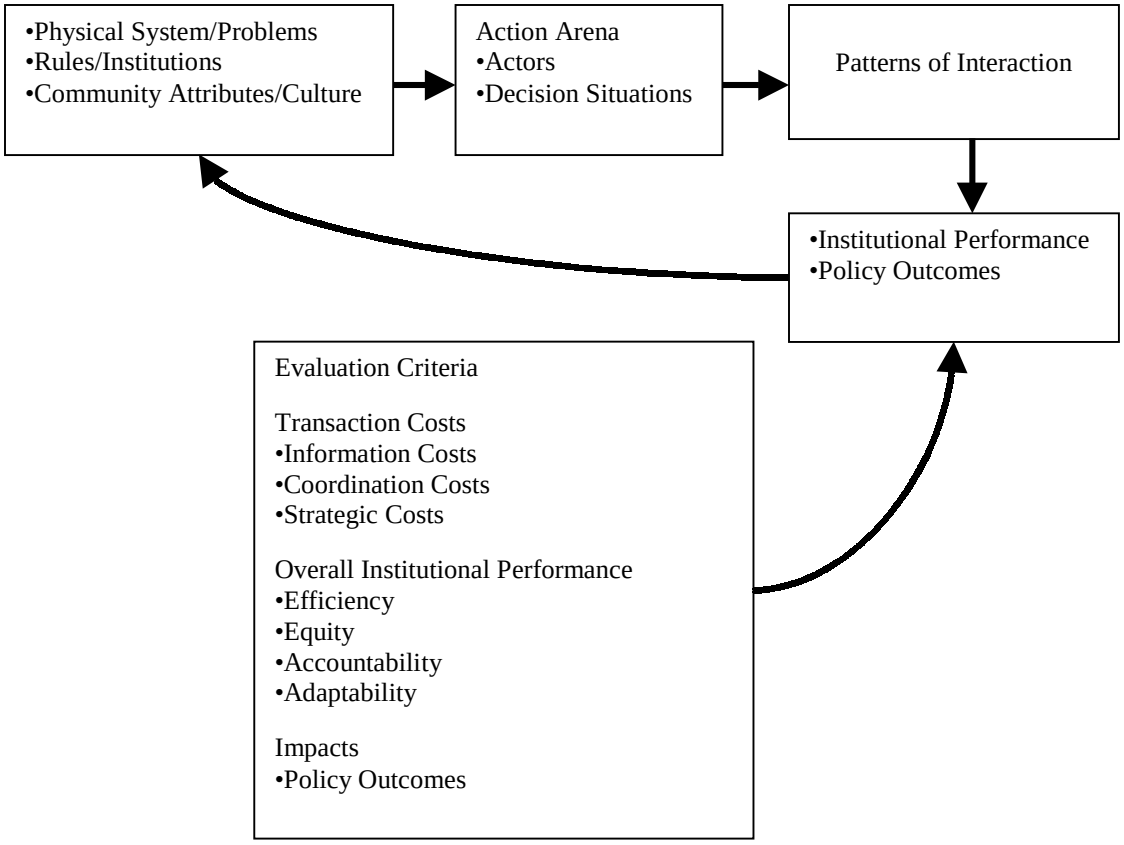
Institutional analysis is therefore an attempt to examine a problem that a group of individuals (or organizations) face and how the rules they adopt address a problem. The IAD framework does not advocate a particular type of institutional arrangement, nor does it rely on a single measure of institutional effectiveness. Rather, the IAD framework argues that three sets of factors influence the interactions between individuals (or organizations) influence the development and implementation of institutional arrangements: the physical characteristics of the system and the nature of the resource management problem; the culture of the individuals (organizations) trying to solve problems; and, the institutional setting that the individuals (organizations) are embedded within (Ostrom 1990, 55). It also argues that a variety of criteria should be used to examine different aspects of institutional performance [Figure 2].

Accordingly, there are three advantages of using the IAD framework to examine the institutional arrangements governing fisheries resources. First, the IAD framework recognizes the full range of transaction costs associated with developing and implementing policies. Second, it contains no normative bias with respect to how policies should be implemented. In other words, it does not assume *a priori* that one type of institutional arrangement is preferred to another. Finally, it relies on a variety of evaluative criteria to identify the strengths and weaknesses of different institutional arrangements that can be used to implement policies. Accordingly, it recognizes that a wide range of policy objectives may underlie any public policy and that success may vary across these different objectives.

**Transaction Costs Associated with Developing and Implementing Fisheries Policies**

The IAD framework draws attention to three interrelated transaction costs associated with interorganizational policy implementation: (1) coordination costs; (2) information costs; and, (3) strategic costs (Ostrom, et al. 1993) [Figure 2]. Transaction costs are likely to increase as the number of bargaining partners and routine interactions increase (Levi 1990, 403). They can also increase when asymmetries of information and power exist. Thus, as jurisdictional complexity increases and the actors' interests become increasingly heterogeneous, transaction costs are likely to increase. The following sections briefly discuss each set of costs and some of the general observations about the importance of these costs in the bureaucratic, market-based, and community-based model.

**Figure 2: The Institutional Analysis and Development (IAD) Framework**




**Source**: Modified from Ostrom, Elinor, Roy Gardner, and James Walker. 1994. *Rules, Games, & Common-Pool Resources.* Ann Arbor, MI: The University of Michigan Press.

### *Information Costs*

Information costs are those associated with searching for and organizing information and the errors resulting from an ineffective blend of scientific and time and place information (Hayek 1945). Scientific information is "acquired by individuals through education and/or experience about the *regularities* of relationships among key variables rather than the particular state of those variables in a specific context (Ostrom, et al. 1993, 50)." Time and place information refers to the knowledge "acquired by individuals who know the nature of a particular physical and social setting (Ostrom, et al. 1993, 50)." It is important to recognize that an effective fisheries management program will require both scientific and time and place information. Fisheries managers need to understand the species and its population dynamics. Fisheries managers also need accurate information about different breeding population and changing local conditions in order to make more accurate population projections. Significant transaction costs can be incurred if the information is combined incorrectly.

Each approach to fisheries management has a different set of information costs and the potential for information asymmetries and distortions. The bureaucratic and market-based approaches both have clear requirements for scientific information. Some knowledge of stock dynamics and the relationship between gear (troll type, mesh size, etc.) and catch is needed to ensure that the regulations developed under the bureaucratic model do not allow catch to exceed a desirable threshold (i.e., optimal yield). Collecting time and place information can be more problematic in the bureaucratic model. Large centralized bureaucratic systems often have difficulty collecting, acting upon, and communicating information. They are also vulnerable to information distortions (V Ostrom 1989). Moreover, since an individual fisher's success in the bureaucratic model is dependent on their knowledge of time and place information such as the location (i.e., feeding grounds) and behavior of stocks (i.e., migratory patterns), there are incentives to withhold or distort this information to maintain their competitive advantage. As a result, fisheries managers often have incomplete or inaccurate time and place information upon which to base management decisions.

While it is important to have accurate scientific information in the bureaucratic model, it is a critical component of the market-based model. In order to make accurate population projections, fisheries managers need to understand the population dynamics of the species and have some understanding of how local conditions influence the reproductive cycle. Because fishers are guaranteed a percentage of the TAC, there are fewer incentives to guard or report false time and place information. However, the market-based approach is much more reliant on an accurate synthesis of scientific and time and place information to set the TAC. Moreover, the costs of inaccurate information are greater. For example, the scientists' lack of understanding the Orange Roughy's life cycle in actually created overfishing in New Zealand because the TAC was set too high based on inaccurate scientific information. Thus, the market-based approach's heavy reliance on accurate information leaves it less room for error than the bureaucratic which might be more capable of absorbing this type of scientific error (Mace 1993).

The heavy reliance on accurate information also presents numerous opportunities for participants to engage in strategic behavior when there is scientific uncertainty that can increase transaction costs. For example, under conditions of uncertainty, scientists are often unsure whether to provide their "best guess" or to take a more pessimistic view of the population levels to counteract anticipated political pressures (Buhl-Mortensen and Torensen 1997). Uncertainty can also move setting the TAC out of the purely scientific realm and subject the process to more political pressure. For example, it creates opportunities for industry scientists to challenge government scientists with respect to setting the TAC. This can make setting the TAC a political rather than a scientific decision. This creates opportunities for some to engage in rent seeking behavior while others (e.g., small fishers) are unable to lobby or rent seek as effectively.

On the surface, the community-based approach would appear to have the lowest information costs. Little emphasis is placed on scientific information. Instead, the systems tend to be built around intensive time and place information gathered as fishers go about their daily work of harvesting the resource and monitoring (i.e., enforcing) each other's behavior. It is also important to point out that long enduring rule systems are often the product of a long trial and error process of trying to get the rules right (Ostrom 1990). In this respect, they have developed an adaptive management system similar to that being advanced in the resource management

literature (Gunderson, et al. 1995; Lee 1995, 1993; Lee and Lawrence 1986; Walters 1986; and, Holling 1995, 1978). It is also important to understand that many of the community-based arrangements that have been studied represent those that survived the trial and error process. Others were less successful and witnessed the costs associated with making resource management decisions based on the ineffective blend of scientific and time and place information.[17] The lack of scientific information can also create the potential for incurring information costs when the community is faced with rapid change (social, technologic, economic, etc.). Costs can also be incurred when communities must decisions with respect to granting "outsiders" access to harvest a portion of the community resource since they may have inaccurate scientific information (e.g., incorrect estimates of stock size).

***Coordination Costs***

Each approach also incurs a different set of coordination costs. Coordination costs include those invested in negotiating, monitoring, and enforcing agreements, which in this case would be the rules governing the fisheries resource (Ostrom, et al. 1993, 120). Both the bureaucratic model and the market-based model will require a significant investment in time and staff resources to develop the policy proposals and to then undergo the negotiation, bargaining, and public comment necessary to obtain the requisite approvals by decisionmakers. In addition, the market-based approach has the added coordination cost of setting and allocating the TAC on a yearly basis.[18] This leaves the system in a constant state of flux that greatly increases the costs of negotiating and maintaining the ITQ system. There are also a whole host of additional negotiation costs associated with the system of trading the ITQs among fishers.

The bureaucratic and market-based approaches also face a different set of monitoring and enforcement costs. One of the main criticisms of the bureaucratic model is that it creates well known incentives to "cheat" and break the rules established by the central government. For example, "one study showed that in the Georges Bank fishery, regulations were frequently violated by a quarter to a half of all fishers. These violators used illegal mesh on almost all trips and fished in closed areas on about a third of their trips (Halliday and Pinhorn 1997, 103)."

There is more disagreement concerning the costs associated with monitoring and enforcement in an ITQ system. One could argue that enforcement costs are lower than the bureaucratic model because managers no longer need to conduct detailed monitoring of gear and other regulatory requirements. For example, in the surf clam and ocean quahog fisheries, British Columbia halibut fishery, and US Atlantic wreckfish fishery, enforcement costs have been lower because the they have achieved cooperation with fishers, and reduced on-boat monitoring (Buck 1995). One could also argue that tracking fish might be less labor intensive than tracking fishing practices (e.g., Clark 1994). The alternative argument is that it merely creates incentives to engage in different forms of cheating behavior (e.g., high-grading, discarding, etc.) (e.g., Palsson and Helgason 1996). For example, the enforcement costs in the Netherlands were such that they decided to return to a bureaucratic model based on input controls (Squires, et al. 1995). Tracking the fish and administering a quota system can also be costly. Accordingly, the costs for monitoring and enforcement in this approach appear to be mixed (Squires, et al. 1995).

The negotiation costs under the community-based approach are someone different. Rather than being the product of a political process, they are the result of a social process of developing shared norms of behavior and acceptable rules of behavior. This process can take a long time and it can require considerable work on the part of the community (Ostrom 1990, 90). However, once the system is well developed the costs of negotiating agreements is greatly reduced. Moreover, the system of self-regulation arguably has lower enforcement costs than the other two approaches.

### *Strategic Costs*

The strategic costs associated with each approach also vary. Strategic costs result from asymmetries in information, power, or other resources such that some obtain benefits at the expense of others. Common strategic costs include free riding, rent seeking, shirking, and corruption (Ostrom, et al. 1993). Several examples of rent seeking behavior have already been discussed. Because the initial distribution of property rights (e.g., ITQs) is subject to rent seeking prior to and during the initial distribution, it is inappropriate to assume that the distribution will be economically efficient for those receiving the rights (Jung, et al. 1996). For example, fishers and industry often seek to modify the rules or TAC so they can extract more rent from the resource. While this can result in short-term financial gains for the fishing industry, the health of the stock and society as a whole suffers as stocks decline over the long-term. Given the political component of the two approaches, it is also possible that the administrative agencies will be subject to capture by these groups. For example, some argue that fisher and industry capture of the regional fishery management councils in the United States is nearly complete and has resulted in both an inefficient industry and policies that hastened the collapse of some species (McManus 1994; and, Wilen 1995). Another important, but little examined, strategic cost that could emerge out of an ITQ system would be the opportunities for corruption and collusion that might result from industry consolidation. While it is unclear how pervasive this type of behavior is, it could create important inefficiencies in the market and lead to a variety of equity problems.

It is interesting to note that while rent seeking behavior is viewed in negative terms by the bureaucratic and market-based models, the same activity in the community-based approach is often viewed in positive terms as consensus building or community leadership. However, communities are not necessarily bastions of equality and community elites can often engage in their own form of rent-seeking behavior that may be costly to the community or the larger society in which it is located. Elites can also capture the system by controlling who has access to the decision-making process (Davis and Bailey 1996).

## Overall Institutional Performance

Given these transaction costs and the different outcomes resulting from the implementation of these three different approaches to fisheries management, what can be said about the overall performance of these institutional arrangements? Four interrelated criteria will be used here to compare and contrast the three paradigmatic approaches to fisheries management: efficiency; equity (including both fiscal equivalence and redistributional equity); accountability; and, adaptability (Ostrom, et al. 1993; and, Blomquist 1992).

### *Efficiency*

Efficiency is viewed here in two different ways. One way is to view efficiency in terms of the market. In other words, what affect does this institutional arrangement have on the market with respect to wealth generation or productivity. The second way is in terms of administrative efficiency and the costs of administering the regulatory program. There are important differences between the three approaches in terms of these two measures of efficiency.

In terms of market efficiency, that is clearly the strength of the market-based approach compared to the other two models. The bureaucratic model in large part is designed to make it more inefficient (increase effort) to harvest the resource. The community-based model, while not intended to be inefficient, often utilizes inefficient fishing practices and relies on easily monitored practices that often are inefficient (Ostrom 1990). Although, many of the concerns regarding market efficiency may be mitigated by the fact that market efficiency may not be the driving concern in many of these communities. Often the community-based approach is employed in social systems where the fishing enterprise is not conducted with the primary objective of wealth generation. Rather, it is part of a subsistence economy.

The evidence suggests that the market-based approach harnesses the very market forces the bureaucratic model interferes with (Gordon 1954). For example, Scott (1955, 117) argued long ago that "long run considerations of efficiency suggest that sole ownership [essentially ITQs] is a much superior regime to competition but that in the short run the ordinary case there is little difference between the efficiency of common and of private property." Others (e.g., Wilen 1995, 42) point out that "[a] critical element missing from US fishery policy implementation is a serious commitment to the objective of economic efficiency." Moreover, Buck (1995, 6) observes that "[t]he international record so far indicates that ITQs can be very effective in reducing or eliminating overcapitalization and the race for fish; also profits and overall economic efficiency can increase, sometimes dramatically." For example, in Iceland, the value of reduced fishing efforts and improved quality was estimated at $15 million in the first year the ITQs (Arnason 1986). While in New Zealand, an early survey of quota holders and Ministry of Fisheries employees indicated that they believed ITQs reduced competition, improved the ability to plan business, and made earnings more predictable (Dewees 1989).

In terms of administrative efficiency, the community-based approach, with its reliance on self-regulation and social sanctions, is likely to incur the lowest administrative costs. The bureaucratic and market-based models will incur substantially greater costs. Given the variations in the design of regulatory programs and ITQ systems, it is hard to make generalizations about which set of administrative costs is likely to be higher. Both are likely to require relatively high monitoring and enforcement costs. However, administering an ITQ system does impose additional administrative costs that a regulatory-based approach often lacks. The ITQ systems must track and manage data from each quota holder and these costs can be significant. For example, implementing the ITQ system in New Zealand increased staff costs by about 10% which went to accountants to follow the paper trail and new computerization requirements (Squires, et al. 1995). The administrative agency will also incur the extra expense of setting and allocating the TAC on a yearly basis while the regulations adopted under the bureaucratic model

will not require the same level of yearly adjustments. Accordingly, it is important that these administrative costs are not neglected from the analysis of institutional arrangements.

***Equity***

Institutional performance can also be judged in terms of equity. Two important aspects of the "equity" concept are examined here. The principle of fiscal equivalence holds that those who benefit from a service should bear the burden of financing it. Thus, those who derive greater benefits are expected to pay more. Redistributional equity is concerned with structuring program activities around differential abilities to pay. Important considerations here are the equality of the process as well as the results. It is important to remember that an efficient program is not necessarily a fair program. While efficiency would dictate that resources be utilized where they produce the greatest benefit, equity concerns can lead to different resource allocations. Moreover, in many cases there are important tradeoffs between efficiency and equity that the fisheries analyst should consider.

Each approach raises a different set of questions related to equity. Under the bureaucratic model, society as a whole (i.e., the tax payers) pays the majority of the costs associated with managing the resource while the fishers receive the majority of the economic benefits. However, license fees and taxes on the profits generated by the fishing industry can help offset some of these societal costs. Under the market-based model, there is some variation in terms of who pays the costs. In some systems, society as a whole pays the majority of the costs with reimbursements from license fees and tax revenues. In other ITQ systems, New Zealand is a good example, fees and levies are used to recover nearly all of the costs of managing these systems (Clement & Associates 1997). Finally, one of the advantages of the community-based approach is that the users of the resource bear the costs of developing and enforcing the rules. Accordingly, it raises few concerns with respect to fiscal equivalence.

Each approach also raises different concerns with respect to distributional equity. To the extent that the bureaucratic model relies on a standard set of rules that apply generally to all fishers, everyone is treated equally. Thus, the rule system does not create inherent advantages for some fishers at the expense of the others. This can help preserve a place for small fishers and help maintain equity within the industry. However, there is always the possibility that rules could be treated that create inequities as well. For example, requiring a new gear type could have a disproportional impact on small fishers as compared to larger corporate boat owners.

One of the main critiques of the market-based model is that steps taken to increase market efficiency often create important problems with respect to distributional equity (e.g., Barber 1989; Buck 1995; and, Young and McCay 1995). A number of important distributional questions are raised by the implementation of an ITQ system. The system used to allocate the TAC to different boat owners can create a whole host of distributional concerns. It can also create distributional impacts in the community. For example, Buck (1995) notes that the industry consolidation that is necessary to increase efficiency can result in job loss and other community impacts. Some of the impacts Buck (1995, 13) observed were "jobs shifted from infrequent trips at sea or rotation among several different vessels to fewer jobs requiring more labor time at sea and on shore with longer periods o the same vessel. Less crew employed for a

longer period of time may result in the same over-all level of employment." Perhaps the most thoroughly documented example of this is the Icelandic fishery. Palsson and Helgasson (1996) studied changes in the composition of the fishing industry and the wage structure. They found that the total number of quota holders dropped 27% between 1984 and 1994, and that the largest quota holders "have almost doubled their shares of the overall ITQs, while the other groups seem to be losing ITQs (Palsson and Helgason 1996, 125)." Accordingly, the ITQ model creates a variety of potential distributional equity problems that should be of concern to fisheries analysts since they are often the source of fisheries conflicts.

At first glance, the community-based approach might appear to raise few concerns with respect to distributional equity. After all, the approach is grounded in "community welfare, distributional equity, and other social and cultural benefits (Charles 1992, 385)." However, as Davis and Bailey (1996) point out, communities themselves contain social inequities. They also correctly observe that "it is clear that local elites are quite capable of capturing the process and benefits of whatever technology or policy changes that come along (Davis and Bailey 1996, 262)." Moreover, aside from the influence wielded by local elites, ethnic and gender differences and differential relationships between a captain and the crew can lead to a wide range of distributional problems (Davis and Bailey 1996).

***Accountability***

Institutional performance can also be evaluated in terms of accountability. An important principle in a democratic society is that government officials be held accountable for their actions. In many developed countries, particularly those with strong democratic institutions, both the bureaucratic and market-based arrangements typically enjoy a high degree of accountability to the public in terms of the processes used to develop and implement rules. For example, in the United States there are opportunities for public comment, open meetings laws, freedom of information requirements, and various oversight mechanisms (e.g., congressional oversight). Moreover, litigation can often be used to ensure that the regulators are held accountable for their decisions. For example, in the United States, the Conservation Law Foundation and the Massachusetts Audubon Society sued the National Marine Fisheries Service and the Secretary of Commerce in 1991 "for failing to prevent overfishing of Atlantic cod, haddock, and yellowtail flounder. A court settlement required the Council to amend the plan in such a way as to eliminate the overfished condition. This required a radical change in management strategy (Halliday and Pinhorn 1997, 102)." Where public accountability becomes a problem is when the decision-making processes are not open to the public.

Assessing public accountability in community-based systems can be more problematic and it will depend on the process used to develop the social regulations. The question of accountability can also be viewed from different perspectives. In one sense, one might conclude that there is a high degree of accountability because of the close relationship between the community and the rules used to govern the fishery. In another sense, you could conclude that accountability is lacking because it may be unclear who makes decisions or sets rules. In this case, if something goes wrong it is unclear who should be held accountable. Perhaps the biggest question is whether there is a mechanism for holding the community accountable to the larger

society of which it is a part. If there is no mechanism, the communities needs will likely end up outweighing the interests of the society in which it is located.

***Adaptability***

The final criterion is whether the institutional arrangement proves to be adaptable over time. Some argue that unless institutional arrangements have the capacity to respond to their ever-changing environments, institutional performance is likely to suffer (Ostrom, et al. 1993, 112 - 116). Moreover, a number of researchers have argued for adaptive management of natural resource systems which encourage learning and institutional innovations (e.g., Smith, et al. 1998; Imperial and Hennessey 1996; Gunderson, et al. 1995; Holling 1995, 1978; Lee 1995; 1993; Lee and Lawrence 1986; and, Walters 1986).

The level of adaptability varies among the three approaches. Adaptability may be one of the great weaknesses in the bureaucratic model. Because of the long time it can take to develop the regulatory system and because it is designed with stability in mind, high costs can be incurred when trying to change the rule system. In part, these costs are the result of having a high degree of public accountability in the process used to develop and implement rules. Moreover, fishers are likely to resist any changes designed to further limit catches. As a result, regulators often encounter a great deal of political pressure when they propose restrictive rule changes. Others blame the high costs of institutional change on agency capture. For example, McManus (1994) blames the high costs associated with institutional change in the U.S. system on capture of the regional counsels by groups of fishers who have politicized the counsel selection process and created resistance to necessary regulatory changes. As a result, bureaucratic systems can end up protecting inefficient practices and ineffective regulations. They can also have trouble responding to small fluctuations in stocks and other small changes in the system. Accordingly, it may take a dramatic or highly visible problem to spur a quick government response.

In some respects, the community-based approach can be thought of as adaptable. The rule-systems are often the product of long social process of reaching agreement on a set of rules to govern the allocation of the fisheries resource. In many cases, “getting the rules right” also involves a trial and error process that is similar to the adaptive management model advocated by Lee (1995, 1993). One could also find evidence that many of these long-lived rule systems have the ability to adapt to smaller changes in the stock, environment, or culture (e.g., Veitayaki 1998; and, Ostrom 1990). However, it is less clear whether many of these community-based systems have the capacity to adapt to large-scale changes. Many community-based systems may have trouble adapting to dramatic changes in effort as a result of such events as the introduction of outside fishers (e.g., foreign trawlers), changes in technology that increase harvest efficiency, changes in local demand, or the development of an export market (e.g., King 1977). For example, the community-based system governing the Northwest Atlantic groundfish was unable to handle these types of changes and the fishery collapsed (Murawski et al. 1997). It is also unclear whether community-based systems can handle large-scale changes in a community’s social structure. It is quite possible that the scope and pace of these changes could outpace the social systems’ ability to adapt and create new rules. The changes could also lead to social changes that topple the existing rule system or change the incentives governing social

interactions. Therefore, it is unclear how effective this approach would be in social systems undergoing rapid or continuous changes.

Unlike the other two approaches, the market-based model is by design much more adaptable. Administering an effective ITQ system requires continuous monitoring of stock and then making annual adjustments in the TAC, usually on an annual basis. Accordingly, it is much closer in principle to the adaptive management model. However, because of the pressures for market efficiency and the desire to set the TAC close to the optimum level (i.e., the MSY), these pressures could lead to errors in setting the TAC too high. This can lead to quicker overfishing than might occur under the bureaucratic model. Accordingly, while certainly more adaptable, The market-based approach is not without some risk.

### *Policy Outcomes*

Thus far, the discussion has not addressed the question of which institutional arrangement is more effective at maintaining fish stocks at a sustainable level. That has been intentional. While arguably the outcome of main concern to many fisheries managers, there is no reason to suspect that one institutional arrangement will be more effective than the others with respect to maintaining fish stocks at desired levels. In fact, a common flaw in policy analysis is to equate institutional performance with policy outcomes. There is no reason to suspect that the two will necessarily be related (Imperial 1999). For example, one could have a poorly performing institutional arrangement, whether defined in terms of market efficiency, equity, accountability, or adaptability, that maintains fish stocks at desired levels because the underlying rules governing the allocation of fish is effective. One could also have a well-designed institutional arrangement that leads to a fishery to crash because the underlying rule is flawed. For example, one might argue that the ITQ system used to manage the Orange Roughy promoted market efficiency, it had an acceptable administrative costs, it did not cause important equity problems, it maintained public accountability, and it proved to be adaptable. However, because the underlying rule (i.e., the TAC allocation) was flawed and based on inaccurate scientific information, the institutional arrangement led to drastic stock reductions.

Thus, fisheries analysts are cautioned against making the assumption that a particular institutional arrangement will necessarily result in healthier stocks. As the Orange Roughy case demonstrates, no institutional arrangement will maintain stocks at sustainable levels if the underlying rules are flawed. Accordingly, it is important that fisheries analysts recognize that a policy's performance is not necessarily related to that of the institutional arrangement. They are separate questions for the analyst to explore. Good policy analysis needs to evaluate each policy alternative's ability to achieve desired objectives. It also needs to explore important questions related to the choice of the institutional arrangement used to implement the policy.

## Summary and Conclusions

Whether one calls them paradigms, perspectives, or resource management philosophies, it is clear that three distinct approaches to fisheries management exist. Each has its own set of policy objectives and normative biases that lead to each approach having different policy objectives. Each approach also tends to rely on a different set of policy instruments and

institutional arrangements to implement their policy proposals. As a result, each approach offers a different set of potential positive and negative outcomes. Each approach thrives within its own community of supporters, but is criticized or ignored by others. This is producing a fragmented and disjointed literature. Fisheries analysts that subscribe to one approach are often overly critical of the weaknesses of the others while at the same time they downplay and even fail to consider the limitations and problems with their own approach.

The disjointed nature of the literature is further compounded by the lack of good comparative institutional analysis. All too often fisheries analysts engage in deficient institutional analysis that uses a "parade of horribles" to justify their preference for a particular institutional arrangement. Others are guilty of falling victim to "single institutionalism" and only examining a single type of institutional arrangement, even though others might better achieve the same policy objective in a given setting. Other analysts are guilty of faulty "lesson drawing" and giving inadequate attention to a particular program's fungibility. As a result, many fisheries analysts examine the wrong question. They spend their time trying to determine which institutional arrangement is more effective in the abstract instead of trying to determine which will work better in a particular setting. This requires that analysts give greater attention to the actors comprising the action arena, the physical setting and the nature of the resource management problem, the attributes of the community where the fishery is located, and the set of rules used to order relationships between the actors. Many times fisheries analysts also fail to examine the full range of transaction costs associated with developing and implementing a set of rules to govern a fishery. Moreover, they fail to give adequate attention to the different ways in which institutional performance can be measured.

We argue that good institutional analysis is inherently comparative in nature in that it remains focused on trying to determine which institutional arrangement will perform best in a particular setting. When examining institutional performance, we recommend that fisheries analysts take a broad view of how performance is measured. It is important for them to explore the full range of transaction costs that can influence institutional performance. Moreover, given the multiple, sometimes competing policy objectives underlying fisheries policy, it is important use a variety of different criteria to assess the overall performance of institutional arrangements and to recognize that tradeoffs will occur among these criteria. The IAD framework is just one tool that can be used to help guide this type of institutional analysis. Our hope is that improved institutional analysis can help fisheries analysts provide better information to decisionmakers. Presumably, this would lead to more effective fisheries management programs.

We also hope that increased attention on comparative institutional analysis will help to bring these three disjointed streams of literature closer together. To borrow an analogy from the Political Science community (Almond 1990), fisheries researchers appear to be sitting at three separate tables. It is time to pull those tables together and start working together if we are to solve the pressing problems facing the worlds fisheries. This requires that researchers begin to develop a greater appreciation for the merits of the competing approaches while giving greater attention to the limitations of their own approach. This paper represents just one small step in trying to advance our understanding of the relative strengths and weakness of each approach. Much more comparative institutional analysis is needed focusing on specific institutional arrangements to further improve our understanding.

This broad-based review of the fisheries literature also raises challenging new questions that are relatively unexplored in the fisheries literature. Many of these questions can only be answered through comparative institutional analysis the cross-fertilization of ideas among the three approaches. Much remains to be learned about the full range of transaction costs confronting each approach. For example, does the industry consolidation which often occurs in an ITQ system create opportunities for corruption and collusion and if so how prevalent is this strategic behavior. There is much left to learn about the tradeoffs among efficiency, equity, accountability, and adaptability and how the problems created by each institutional arrangement can best be mitigated. Moreover, the discussion has been premised on the existence of three competing paradigms, but is there a fourth that resides near the center of Charles' (1992) paradigmatic triangle [Figure 1] that combines the best of each approach? If not, at a minimum additional research is needed to determine: 1) the limits and optimal conditions for each approach; 2) the social, geographic, and biological conditions that influence institutional performance; and 3) are there any basic rules of thumb that we can develop to help in the selection of policy tools? Clearly, decisionmakers could use this type of advice.

Finally, the discussion has touched briefly on the process of institutional development and we have noted that some fisheries have started out with community-based arrangements that evolved into bureaucratic and then market-based systems. It is unclear how this process occurs. Moreover, it is unclear what these systems will evolve into next. Can we use, as Scott (1993) suggests, an ITQ system as a basis for new self-governing arrangements? Perhaps a new approach will emerge in the next millenium that breaks the paradigmatic triangle? Regardless of where things go in the future, a greater understanding of the process of institutional development will help to facilitate the transitions from one approach to the next. This is yet one more area where institutional analysis will help to better inform the work of policy analysts.

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## Notes

[1] A paradigm shift occurs when a significant body of knowledge that is contradictory to, or unexplained by, the accepted paradigm accumulates. New perspectives and theories then emerge to account for discrepancies in the traditional paradigm. Eventually, a new paradigm replaces the traditional one (Kuhn 1970).

[2] Charles (1992) identified these paradigms as conservation, rationalization, and social community. Our approach shares many similarities and builds on his earlier path-breaking work. Our bureaucratic model is similar to his conservation paradigm. Our market-based model is similar to his rationalization model. Our community-based model is similar to his social community paradigm.

[3] Examples of some of the research on the bureaucratic approach, its limitations, and how it could be improved see Lansford and Howorth (1994), Charles and Yang (1990), and Coldwell (1990).

[4] For examples of criticisms of this approach see Clark, et al. (1988) and Clark (1994).

[5] Optimum Yield (OY) is a combination of "(a) the greatest overall benefit to the nation , with particular reference to food production and recreation opportunity, and that (b) is prescribed as such on the basis of maximum sustainable yield as modified by any relevant economic, social, or ecological factors (Halliday and Pinhorn 1997)."

[6] For a good review fisheries management in the United States see Wise (1991). For a discussion of the activities of the regional fisheries councils in the United States see Branson (1987), Fullerton (1987), Miller (1987). For a discussion of the problems with state management of inshore fisheries see Cox (1988).

[7] Canada and the US have some limited experience with market-based regulation, but the bureaucratic approach tends to dominate most fisheries regulation in these countries.

[8] Derbies occur when there is a race to catch the allotted allocation of fish.

[9] While ITQs were proposed as early as the 1950s (e.g., Scott 1955), they didn't gain widespread acceptance in the fisheries management literature until the 1980s.

[10] For examples of research illustrating the market-based approach see Buck (1995), Clark (1994), Hatcher (1997), Sanders and Beinssen (1997), Scott (1955, 1993), and Squires, et al. (1995).

[11] It should be noted that there are some that argue that the market-based model actually encourages overcapitalization (Schlager 1990).

[12] High grading refers to the practice of sorting fish at sea and throwing back the smaller or less valuable fish so that the maximum revenue per ton of quota is generated. Other forms of quota busting include: false reporting of catch information; dumping by catch so that the quota is not used up; or, attempting to divert catch to ports outside of the monitoring system so that it does not count against a quota.

[13] One could also argue that the community-based model could be further subdivided into a series of different literature streams, or competing sub-paradigms that are particularly evident in other policy areas. Candidates would include work in the area of ecosystem-based management (e.g., Burroughs and Clark 1995; Grumbine 1994; Slocombe 1993a, 1993b; and, Backus and Bourne 1987), watershed management (e.g., Hennessey 1994; Imperial 1999; and, Imperial and Hennessey 1996), integrated environmental management (e.g., Mackenzie 1996; Born and Sonzogni 1995; and, Underdal 1980), integrated coastal zone management (e.g., Cicin-Sain 1993), and adaptive management (e.g., Smith, et al. 1998; McLain and Lee 1996; Gunderson, et al. 1995; Lee 1995, 1993; Lee and Lawrence 1986; Walters 1986; and, Holling 1995, 1978), and sustainable development (e.g., Pirages 1996; and, Moffatt 1995). Cortner and Moote (1994) argue that the common characteristics of this emerging paradigm are the emphasis on resource systems (e.g., ecosystems) and collaborative decision making and shared community values. However, our analysis is limited to a discussion of community-based management in the fisheries context.

[14] The approach goes by different names including community-based regulation, community-based management, self-regulation, folk management, and delegated management authority. In this paper we focus on the line of research examining community-based management. For examples of this line of research see King (1997), Mantjoro (1996), McCay (1998), Nugent, et al. (1996), Schlager and Ostrom (1993, 1992), Schlager (1990), and Veitayaki (1998). Another related line of research that makes arguments similar to the community-based literature focuses on the co-management of fisheries. The objective remains self-governance, but instead of focusing on the community, co-management focuses on delegating management authority to industry or cooperatives as the basis for self-regulation. For a discussion of this line of research on delegated management authority see Dyer and McGoodwin (1994), Jentoft (1986), Jentoft and Sandersen (1996), Lim, et al. (1995), Pinkerton (1989). For a critical appraisal of this line of research see Jentoft and McCay (1995). For a discussion of some of the problems in implementing both approaches see Palmer and Sinclair (1996).

[15] See Rose (1993) for an extended discussion of the lesson drawing process.

[16] A detailed discussion of the Institutional Analysis and Development (IAD) framework is beyond the scope of the paper. For more discussion of the IAD framework see Crawford and Ostrom (1995), Ostrom, et al. (1994), Ostrom, et al. (1993), Ostrom (1986, 1990), Blomquist (1992), Sproule-Jones (1993), and Kiser and Ostrom (1982). For a critique of the IAD framework and a comparison with other theories of the policy process see Schlager and Blomquist (1996).

[17] A detailed discussion of fragile and failed community-based institutional arrangements can be found in Ostrom (1990, 143 – 181).

[18] In some cases such as New Zealand, the sub-components of the TAC which include commercial catch, recreational catch, and the Maori native rights catch also have to be allocated on a yearly basis.

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