

Capturing the Commons: Devising Institutions
to Manage the Maine Lobster Industry

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July 2001

Chapters 1-3

WORKSHOP IN POLITICAL THEORY
AND POLICY ANALYSIS
615 NORTH PARK
INDIANA UNIVERSITY
BLOOMINGTON, IN 47408-3896 U.S.A.
Feb. 2001 *Book 1*

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JULY 2001 VERSION

Begun 3/9/01. Last worked on 3/13/01. Edited by Ann 4/1/01. Corrections completed 4/24. Bib fixed 4/27. Reworked June 2001.

Preface

The 21st century is opening on the specter of worldwide environmental disaster caused by human beings. Stocks of fish, forests, grasslands, agricultural land, wildlife, air quality and water quality have all been seriously degraded either by overexploitation, or pollution or a combination of the two. Marine fisheries are in particularly poor condition. According to FAO analysis "sixty nine percent of the fish stocks in the world are exploited at a level at or beyond the level corresponding to MSY [Maximum Sustainable Yield]" (Garcia and Newton 1997: 14).

Environmental disaster is not inevitable, however. There are a number of cases where local level communities and governments have been able to generate rules to effectively manage resources at sustainable levels (Anderson and Simmons 1993; Baland and Plateau 1996; Berkes 1989; Dyer and McGoodwin 1994; McCay and Acheson 1987; Ostrom 1990; Pinkerton 1989; Ruddle and Akimichi 1984). However, at this point it is not at all clear why some communities have succeeded in conserving the resources on which their livelihood depends when the vast majority have failed. This situation means that two of the most critical questions for resource management are: Under what conditions will people over exploit critical resources, and why do their governments let them do it? Under what conditions will people conserve resources? Despite their centrality, the answers to these questions are not at all clear at this point. The answers to these questions will only come by comparing cases where resource management has

succeeded with those where it has failed. This book attempts to answer these questions by focusing on the Maine lobster industry.

The Maine lobster industry is one of the most remarkably successful fisheries in the world today. Since the late 1980's, catches have been at record high levels despite decades of intense exploitation. Even in the 19th century we have never produced so many lobsters. More surprising to managers is the fact that catch levels have remained relatively stable from 1947 to the late 1980's. While there is no consensus on the reason for these high catches, there is a growing consensus that they are due, in some measure, to the long history of effective regulations which the lobster fishing industry has played a key role in developing. There can be little doubt that the lobster industry has developed a strong conservation ethic, and that they have been very active in the political arena. Robin Alden, who was Commissioner of the Maine Department of Marine Resources in the mid-1990's noted that "to others, lobstermen stand out among commercial fishermen as a group which abides by conservation rules and supports them-the only group which apparently has not yet depleted its resource....Most agree that lobstering is the only segment of the industry that is generally well organized politically" (Alden 1996). However, the generation of formal conservation laws is part of a much larger effort.

In retrospect, lobster fishermen¹ have been bound and determined to maintain the fishery for themselves and the children of their communities. There are elements of altruism in this, mixed with self-serving motives. They have used several different strategies to this end. Some of these strategies involve working with the government; others involve agreements among industry groups. Most are legal, but some involve some illegal activity. First and most important, they have gone to great effort to influence government organizations at various levels

to get the formal rules they have wanted. They have had unusual success in lobbying the Maine legislature for over 100 years and, more recently, they have heavily influenced the decisions of the New England Regional Fisheries Management Council (NEFMC) and the Atlantic States Marine Fisheries Commission (ASFMC). The rules that emerged were the result of negotiations, strategies, and decisions among a number of players, including industry factions of various types, state bureaucrats, legislators, Federal agency officials, scientists, members of the U.S. Congress, judges, and recently conservationists. In a large number of cases, the industry has been able to get the rules that they—or at least, powerful industry factions— wanted; in other instances they have been able to block rules they did not want. In only rare cases have they had to accept rules they regarded as detrimental to their interests. The negotiations and political maneuvers between these actors and groups were often rancorous and marked by hostility. Industry factions fought other industry factions; officials of one agency were opposed to the proposed actions of other officials in other agencies; in many cases, industry and government agencies were at odds. Scientists and fishermen have little trust in each other. In all of these various tussles, genuine concern for conservation was all too often of secondary concern. Nevertheless, the rules that have been produced appear to be effective in sustaining the resource.

Second, during the last 25 years the lobster industry has expended a lot of time and effort to fight efforts by the federal government to impose certain management rules. For two decades, the New England Regional Council was not able to formulate a lobster management plan that could get enough political support to be enacted into regulations. This long stalemate can only be described as a kind of policy failure. Behind this long-running dispute is a major difference in the world view of the federal and state agency scientists and that of the fishermen, which led to

differences in opinion about how to manage the fishery. As we shall see, neither side has a premium on truth. Many of the ideas of the industry about what controls the stock of lobsters can only be charitably be called 'folklore;"and the science behind the federal policy is a lot less "scientific" than the scientists would want to admit.

Third, the industry wanted services or rules that the government could not or would not provide. In some instances, industry groups were able to provide rules they wanted by informal means, which they call "gentlemen's agreements." Of particular importance are the trap limit rules that five harbors were able to provide for themselves.

Last, the fishermen in each local area have developed traditional lobster fishing territories designed to reserve the lobsters in specific areas for people from a harbor or a few contiguous harbors. These territories are the result of long-standing competition between groups of lobster fishermen for fishing space. Fishermen are allowed to place traps only in the traditional area of their harbor; people fishing in the territories of other harbors are sanctioned, usually by the molestation of their lobstering gear. Territorial changes are completely the result of the decisions of groups of fishermen to defend their boundaries and invade the territories of other groups. If the men from a particular harbor are successful in defending its boundaries, they remain the same; if they fail, the territories change. In the past, such conflicts have gotten out of control and have resulted in the destruction of a good deal of lobstering equipment. The territorial system is not recognized by the state, and maintenance of this system involves some illegal activity. Over the course of the last 100 years, the system has undergone a number of changes in response to new technology, increased law enforcement, and ecological changes.

An unusual combination of factors has allowed the lobster industry to devise these rules.

As we shall see, both decentralized and centralized rules are produced by political entrepreneurs bargaining over distributional issues. Many rules are by products of contests over who gets the lobster who gets the lobster).

To explain these phenomena, several different bodies of theory are employed.

Rules, Institutions and Organizations

Most of the lobster fishing industry's efforts to control the resource and influence the environment in which lobster fishing takes place involve the generation of rules. Questions about the generation of conservation rules take us into the middle of one of the most important debates concerning social life-namely how do norms and institutions come into being and change? While the generation of norms and institutions has never been the primary focus of attention for any social science discipline, the problem has been approached by people from virtually every social science over the course of several decades. In the 1960's and 1970's, anthropologists were making some key contributions to this field with the work of Barth (1981), Bailey (1969), Heath (1976) and Kapferer (1976). More recently, the most seminal work has been done by political scientists, economists, and sociologists interested in what is known as rational choice theory and the closely related fields of institutional economics and institutional analysis and development. People in these fields are generally known as the "new institutionalists". The analytical tools employed in this book draw heavily on the insights and concepts of this literature.

Several important theoretical commitments lie behind the analysis in this book. First, the

new institutionalists explain the generation of institutions in terms of the rational or goal-oriented decisions of individuals. Decision are defined as "rational" when individuals use the scarce assets at their disposal to achieve their aims most efficiently. In many situations the outcomes for an individual are dependent on the choices and rewards of others. People choose to establish norms because norms make it possible to gain the benefits of coordinated activities and joint ventures. Conversely, individuals will tend to change norms or defect from them when it is in their best interest to do so.

Second, the new institutionalists use the term "institution" to mean a rule or norm-either formal or informal-that can be enforced (Ostrom 1999b: 50). North (1990a:3) defines institutions as the "rules of the game" and this definition is very similar to the one employed by anthropologist F.G. Bailey in *Strategems and Spoils* (1969). In this book, I will use "institution" in this sense, although it is not the standard definition used by anthropologists or sociologists by any means.

Third, institutions structure social interaction. They make the behavior of other humans more predictable and thus reduce risk and uncertainty. In an uncertain world, institutions provide a basis for making decisions with reasonable assurance because they help to ensure the actions of others. Institutions, in the words of John R. Commons (1934: 705) "secure expectations . A rule that one must drive on the right hand side of the road gives drivers a high degree of certainty about what the drivers of oncoming cars will do. With such a rule, the risks of driving are far less than they would be in the absence of the rule. Another example are legal contracts, which are clusters of rules that give entrepreneurs some control over the behavior of others with whom they do business. The lower risk by helping to ensure supplies of raw materials and labor, markets

for goods, and more stable prices. However, rules do not determine all behavior. As Elizabeth Colson (1974: 52) has pointed out, "rules do not solve all problems; they only simplify life".

Fourth, institutions are a substitute for information. In a world of perfect knowledge, there would be no need for institutions (Coase 1960). If a farmer knew what prices for crops would be at the time of harvest, he or she could make decisions about which crops to grow with vastly increased assurance of high profits. In the absence of such information, he can reduce risks by selling his crop through the institution of the futures market to get a guaranteed price. One may not know how to make a needed chemical, but one can enter into a contract with a firm that does have this expertise.

Fifth, institutions are constraints limiting choices, but they also open opportunities as well. For example, a contract between buyer and seller specifying the price and delivery schedule of a raw material is a constraint on both parties to the agreement.. However, an entrepreneur might be unwilling to produce a final produce using this raw material in the absence of such a contract.

Sixth, institutions count. Institutions are rarely completely fair. They favor some people over others. Individuals are aware of this and attempt to devise institutions that will benefit them. In this regard Jean Ensminger says "the underlying assumption is that institutions directly affect economic outcomes (distribution and growth), that individuals realize this, and that they attempt to change institutions to serve their ends more effectively, whether these ends be ideological or materialistic (1992: xiii). As we shall see, the politics of lobster management have been dominated by conflicts over rules to favor one industry faction or another.

Seventh, the new institutionalists see property rights as a key institution. Property rights

are bundles of rights over goods or real estate which are enforced. (North 1990a:33). The type and security of property rights influences decisions concerning investment, conservation and efficiency. In Eggertsson's terms "It is obvious that the nature of control matters for economic actors: short-term control shortens the time horizon; uncertain control discourages potentially profitable projects; lack of control incites costly races for possession; restricted control allocates assets to inferior uses" (1993: 2). There is, for example, a large body of literature on the common property problem which links the decision to over-exploit natural resources to the absence of property rights, creating what Hardin called the "tragedy of the commons" (Acheson 1988; Hardin 1968; Scott 1955).

Eighth, one of the most important insights of the new institutional economics is that institutions stem from problems in markets. Basically this approach assumes that people obtain the goods and services they want through transactions with others. They will use the institution of the market when it is working well, but when the price system is not working well, they are able to make arrangements with each other (i.e. non-market institutions) to obtain the things they need. In Arrow's terms (1971: 5), "there is a wide variety of social institutions, in particular generally accepted social norms of behavior, which serve in some means as compensation for failure or limitation of the market." The new institutional economists have used this insight to account for the generation of a large number of different kinds of social arrangements, ranging from firms, markets, and property rights to clubs, families, and associations (Acheson 1994a: 6-7). Some of these arguments about the generation of non market institutions are of special interest to anthropologists. Robert Bates (1994: 45-52) provides a particularly good account of the causes of market failure, and the types of non-market institutions that result from each. Landa (1997: 1-6) argues that markets and contract law regulate exchange in modern economies, but ethnic trading networks are of critical importance in developing countries, and gift exchange systems

(e.g., the Kula and potlatch) is the dominant economic institution in tribal societies.

Perhaps most important of all, the new institutionalists are committed to the idea that human behavior is strongly influenced by institutions, but that institutions do not determine all choices. Rather, they influence the costs and benefits of behavior and thus influence choices and strategies (Ostrom 1999b). In some instances, the costs of disobeying a rule are so high (or the benefits so high) that choices are severely limited; in others cases, there is ample room for independent action. The complex relationships between strategic action and institutions are perhaps best spelled out by Ostrom and her colleagues in what they call the "IAD framework" [Institutional Analysis and Development. (See Ostrom 1999b).

Institutions and Organizations.

Institutions are different from organizations. Institutions are rules, and norms defining interaction and competition. Organizations are the units formed in accordance with these rules. According to North (1990a: 4-5), are groups of people whose interactions are regulated by rules that come into being "achieve some objective." Lineages, firms, trade unions, political bodies, clubs, associations, schools are all types of organizations.

The distinction between institutions and organizations is at the root of a central division within institutional economics. North focuses on institutions; Williamson is concerned with organization. North and his followers are interested in long term, evolutionary, "invisible hand" processes determining how norms, rules, and institutions come into being in the first place (North 1990a ; Alchain 1950). North argues that institutions have a strong influence on economic development. Efficient institutions allow entrepreneurs to gain the benefits of trade by lowering the costs of transacting business.

The result is aggregate growth in the society as a whole. North documents that the rapid development of the industrialized West is due in no small part to the development of rules giving secure property rights, standardized weights and measures, money and centralized banks, commercial law, and transportation facilities (North 1990a: 9, 34, 107 ff, 124; 1990b). Such institutions do not exist in Third World countries, with the result that per capita income is very low.

Williamson and others in the transaction costs economics school have focused on the ways in which economic organizations are developed . They are primarily interested in how firms firm owners put together various types of organizations using the options defined by the basic institutions or rule sets (Williamson 1975, 1979, 1985, 1996). A key concept in their analysis is that of transaction costs, which are the costs of obtaining the information necessary to make an exchange, the costs of negotiating the exchange, and the costs of enforcing the exchange (Hodgson 1988: 201; Williamson 1985: 2). The kinds of organizations that emerge are the result of entrepreneurs attempting to economize on transaction costs. Essentially, they argue that entrepreneurs respond to various kinds of transactions costs by entering into a variety of agreements with other economic actors (other firm owners, employees, banks), resulting in a wide variety of "governance structures, (i.e. firms, and "hybrid" organizations) linked together with different contractual arrangements and having different degrees of dependence on markets (Williamson 1975: 102-105; Williamson 1985: Chaps 4-6; McNeil 1978).

To date, most of the efforts of the transaction costs economists has gone into understanding markets and hierarchies. However, Williamson (1996: 59) states that the same approach can be applied to "the study of economic organization in all its forms" including unions, international trade, family organization, and government agencies.

Despite this difference in emphasis between North and the transaction cost economists,

the evolution of institutions and organizations is inextricably tied together. What kinds of institutions come into being depends on the rule system; but the institutions, in turn, influence what kinds of rules are produced and how they change (North 1990a: 5).

One of the basic differences between North and Williamson concerns efficiency. Williamson and his followers argue that organizations are selected with efficiency in mind. North argues that the right kind of institutions increase economic efficiency, but that inefficient institutions and organizations exist. "Organizations will be designed to further the objectives of their creators." (North 1990a: 73). Sometimes it is in the best interest of these creators to have inefficiency, as the existence of featherbedding rules, monopolies, protective tariffs attests. As a result, institutions are a "mixed bag of those that induce productivity increase and those that reduce productivity." North 1990a: 9).

In this book, we will draw on the work of Douglas North since the primary task is to understand the way rules are devised, but the insights of the transactions costs economists are of use in analyzing the organizational problems of the fisheries management agencies.

Generating Institutions: The Problem of Collective Action

Rules make it possible for humans to coordinate their activities and achieve goals they could not achieve alone. But simply because they bring about collective benefits is no guarantee that they will be provided. The problem was first framed by Mancur Olson (1965) who pointed out that even if rules or other public goods would benefit all, they will only be provided if "special incentives" exist. The essential problem, he saw, was that there is no incentive for individuals to help to produce a public good since they are going to have the benefit of it

regardless of whether they contributed to producing it or not. Since it is rational for every individual to "free ride" on the efforts of others, the public good is not produced. Everyone has acted rationally, and yet they are all worse off than if they had cooperated. The solution is either rewards or sanctions to overcome the "free rider" effect.

More recently, rational choice theorists would phrase the problem in terms of a collective action dilemma (Elster 1989: 17; Taylor 1990: 223). These are situations in which there is a divergence between the interests of the individual and those of the society. Most communal action dilemmas can be modeled as prisoner's dilemma games (Taylor 1990). The solution to collective action dilemmas is to establish rules constraining the behavior of individuals. In the absence of rules, rational action by the individual will bring sub-optimal results or even disaster for the collectivity. In collective action dilemmas, it is not rational for individuals to cooperate, even though cooperation would bring positive results for all.

The poor results produced by "rational action" provide an incentive to get rules and norms. In collective action dilemmas, as Coleman (1990: 251) points out, the activities of one person produce externalities for others. That is, they are permitted to foist some of the costs of their activities on others. It is the existence of externalities that brings the demand for norms. People whose interests are being damaged by the activities of others have a strong incentive to produce rules to curb the damage, while those who stand to gain in the short run have a strong incentive to oppose such rules.

Common property resources, including marine fisheries, present a classic communal action dilemma. In the case of fisheries, it is in the self interest of individual skippers to get as many fish as possible, even though a rule constraining exploitive effort would result in a

healthier breeding stock, increased catches, lower prices for consumers, and a sustainable industry. In most fisheries, the conditions necessary for the generation of norms have been largely absent, with the result that large numbers of fish stocks are dangerously overexploited. Such failures to solve the collective action problem have been documented in great detail in the literature on fisheries and common property resources (Acheson 1989a; Hardin and Baden 1977; McGoodwin 1990). The lobster fishery is different in that it has repeatedly solved the collective action dilemmas it has faced. Repeatedly it has gone to the government to get formal rules, which Taylor (1990: 225) calls a "centralized solution;" it has also produced informal rules, a "decentralized solution."

Collective action dilemmas have received an enormous amount of attention from social scientists, primarily because they describe so many of the most vexing problems plaguing humanity. Elster and Taylor go so far as to say that "politics is the study of ways of solving collective action problems" (Taylor 1990: 224).

Among rational choice theorists there is a consensus that rules to constrain individuals will improve outcomes in collective action dilemmas. However, there is little consensus on the conditions under which such rules are generated (Taylor 1990: 224-5). It is clear that people will not cooperate to produce rules or other kinds of public goods if those who did not sacrifice to produce them get most of the benefits. Curbing "free riding" is essential. For this reason, there is a consensus that people will be able to provide themselves with rules and institutions if the group is small, people know a good deal about each other's past performances, if the game is played repeatedly, and if the rules can be enforced (Coleman 1990:254, 272; Elster 1989: 41; Knight 1992: 48-64, 174-178; North 1990a: 12, 32-36; Ostrom 1990: 71-72, 189; Taylor

1982:50-51; Wade 1994: 215). In such circumstances, people know who is likely to cooperate, and can monitor behavior and sanction shirkers.

However, a very large number of variables have been mentioned as facilitating the production of norms and rules, including homogeneity, social capital, community, trust, political entrepreneurship, discount rate, heterogeneity, group size, ability to change the rules, etc. (Ostrom 1990: 188; 2000a; 2000b; Taylor 1990: 224-25). In addition, several different theories have been developed concerning the process by which norms or rules are produced including those of Jack Knight (1992), David Lewis (1969), Douglass North (1990), and Robert Sugden (1986).

Much of this book is devoted to explaining how the Maine lobster industry solved a variety of communal action dilemmas at several different levels. As we shall see, a complicated set of factors is involved in the production of rules in the Maine lobster industry. All of these variables have been mentioned in the literature at some point, but the exact combination of those variables appears to be unique.

Property Right, Territorially, Policy Failure and Communal Action Dilemmas-

Three phenomena have strongly influenced the strategies and activities of the lobster industry in its efforts to solve its communal action dilemmas. One is the common pool nature of the resource; the second is the territorial system; the third is the policies and activities of the Federal government.

Property Rights and Common Pool Resources

The problem of conserving renewable resources, including the lobster, are greatly compounded by the property rights system involved. Twenty years ago, the most popular explanation for the over exploitation of renewable resources was that they were "common property resources." That is, resources such as fish stocks, air, rivers, oceans, grazing land, publically owned forests, and grazing land are owned by no one and thus are protected by no one. As a result, people using such resources were thought to have no incentive to conserve them. Why should a person finding a school offish conserve the school when they would just be caught by some other skipper with a matter of hours? Under such circumstances, the users of such resources were only being rational when they took as much of the resource as quickly as possible. As a result, the over exploitation and waste of such resources was thought to be inevitable (Acheson 1989a; McCay and Acheson 1987).

Privately owned property, by way of contrast, had an owner to protect it. He or she could conserve the resources for the future, or exchange them for other goods, depending on which was most profitable. As a result, privately owned goods were thought to used more efficiently or conserved (Scott 1955).

Currently a much more sophisticated model of ownership rights has been developed. A distinction is made between types of property depending on the ability to exclude others from using it, and subtractability, which refers to the degree to which the use of the resource by one person subtracts from the amount of that resource that can be used by another. *Privately owned resources* are subtractable, but they have a private owner who can exclude others from using these resources. Most of the time, this means that they are used efficiently and conserved, but under certain conditions, privately owned resources are clearly over exploited and used

inefficiently (Acheson 1989a; McCay 1992).

Public goods are characterized by difficulties of exclusion, but are not subtractable. Since it is difficult or impossible to prevent others from using such goods, there is little incentive for individuals to provide them. As a result, they usually must be provided by governments. Police protection and military defense are classic examples. Once these services are provided, they benefit everyone in the society whether they have paid for them or not. Moreover, one person's use of these does not detract from another person's ability to use them.

Many renewable resources, including many marine fisheries, are *common-pool resources*. This type of property has two important characteristics. They are **subtractable** resources, which means that what one person uses subtracts from the common pool so that another person cannot use it. In addition, it is **difficult to exclude** people from using the resource. When the group of people exploiting the resource cannot or will not generate rules to constrain their usage, these resources are subject to a kind of escalating abuse that may cease only when the resource is greatly reduced or completely destroyed.

It is important to distinguish "open access resources," where there are no barriers to entry, from common-pool resources. Open access resources are always over exploited since anyone can exploit these resource and no one has any incentive to invest in them. As a result, the term "open access resource" has long been synonymous with resource destruction. Common-pool resources can also be over exploited when no rules concerning the use of such resources are developed. Nonetheless, it is possible for groups of people using common-pool resources to generate rules to regulate entry and control exploitation. Some common pool resources, such as the municipal forests of Germany, are very well managed. However, it is always difficult to get

people to produce rules. When those using a common-pool resource fail to generate controls on entry and rules to regulate the use of the resources, these resources too are subject to extreme over exploitation. The problem for those using common-pool resources is how to generate the rules necessary to sustain the resource. The lobster industry has been quite successful in this task.

Several different solutions have been proposed for the management of common-pool resources. Hardin (1968) saw the solution as top down management by the government, which might have to be imposed by autocratic means. Several economists who have studied the "common property" problem have proposed to manage such resources by simulating property rights through the use of licensing, limited entry, individual transferable quotas, etc. Such rules give users some of the rights associated with private property. There is a third alternative, namely management by communities or groups of private citizens. A number of such systems have been described (Anderson and Simmons 1993; Baland and Plateau 1996 ; Berkes 1989; Dyer and McGoodwin 1994; McCay and Acheson 1987; National Research Council 1986; Ostrom 1990; Pinkerton 1989; Ruddle and Akimichi 1984).

The classification of types of goods according to exclusion and subtractability is contained in the figure below.

Figure 0.1 A Classification of Goods

		Subtractability	
		Low	High
Exclusion	Difficult	Public Goods	Common-Pool Resources
	Easy	Toll Goods	Private Goods

Source: Ostrom, Gardner and Walker (1994: 7).

Understanding the production of each type of good poses substantial challenges. This task is made more difficult by the fact that each of these types of goods differs from the other, and there are also several different types of each good. This volume is devoted to understanding the management of the lobster, which is a common pool resource. However, some aspects of the lobster territorial system and the services of the agencies charged with managing the lobster are best considered to be public goods. As we shall see, some of the problems of the management agencies can be explained by the public goods nature of the services they produce.

The Territorial System. The territorial system is a unique feature of the lobster industry. In order to go lobster fishing at all, a person must gain entry into a harbor gang, a group of fishermen who fish in a territory, which they defend by surreptitious trap cutting. For our purposes the territorial system is very important because it confines people to fishing in a relatively small area with people who they know well, and on whom they are dependent. As we shall see, this situation plays no small role in allowing these groups to devise several different kinds of rules.

The territorial system is one of the unique features of the lobster fishery. While this system may seem exotic and unusual in a modern country, riparian rights and ownership of ocean areas is quite common in worldwide perspective (Acheson 1981: 280-281). In a large number of maritime societies, rights to exploit ocean areas are variously held by communities, kinship groups, or individuals under a wide variety of property rights regimes. Of course, virtually every society makes territorial claims on the land it occupies.

Federal Actions and Policy Failure. Lobster management involves cases of both policy failure

and success. The State of Maine has succeeded in developing of some effective laws that are supported by the industry; and recent efforts by the Atlantic States Marine Fisheries Commission (ASMFC) appear to be headed for success. However, the actions of the U.S. Federal government have done little for conservation and have stimulated a strong political response in the lobster industry. Beginning in the 1960 and continuing through the 1970's the U.S. Congress passed a number of laws regulating the environment, including the Clean Air Act, the Clean Water Act, and the Environmental Protection Act. Four laws were passed that were to have a profound impact on the management of fisheries. The most important was the Fisheries Conservation and Management Act, which went into effect in 1977, and the Sustainable Fisheries Act of 1996, which essentially updated and strengthened the provisions of the FCMA. These laws resulted in agencies of the Federal government attempting to impose regulations to manage the lobster fishery in a top down fashion. The industry was strongly opposed to many of these regulations, for, as we shall see, very good reasons. The result was a long political stalemate lasting for decades, in which no comprehensive lobster management plan was forthcoming. The leaders of the lobster fishermen's Associations (i.e. the Maine Lobstermen's Association, the Downeast Lobsterman's Association, and the Massachusetts Lobstermen's Association) played a prominent role in organizing the opposition to these federal policies to get policies the industry could live with.

The Congress also passed the Endangered Species Act, and the Marine Mammal, but these have had less effect on the lobster industry to date. But, as we shall see, they could pose an extreme threat to the industry in the near future. In short, the actions of the Federal Government posed a series of problems for the industry which could only be over come by getting the industry

to organize in opposition. Federal actions posed still another kind of communal action dilemma for the lobster industry.

These four pieces of legislation were designed to further the cause of conservation in Federal waters. However, the way they have been imposed, has done little for the cause of lobster conservation. We need to discuss in some detail the reasons for this kind of policy failure.

As we shall see, some of the ideas developed by political scientists and others to explain policy failure help to explain the failure of federal fisheries policy. But none of them fits the case precisely. Most important, this body of literature largely ignores the key problem underlying fisheries policy, namely the problems with science. Although scientists use what are considered to be up to date simulation models, they have not been able to predict changes in stocks. This has led them to recommend policies the industry has opposed for very good reasons (Acheson and Steneck 1997). Unfortunately, the problems in the science cannot be cured by fine tuning the model and tinkering with it. The problems are far more basic, and suggest that we need a new approach to fisheries management.

The lobster industry has long promulgated laws that control "how" fishing is done, and make no attempt to control the amount of lobster taken. We call this "parametric management" (Acheson and Wilson 1996a; Wilson et al. 1994). Although this approach is not supported by fisheries scientists in general, it appears to work well in the lobster fishery. Similar kinds of rules might work well in other fisheries as well.

The State of Maine and the ASMFC, which have developed more successful rules and policies, have coordinated their efforts with those of the industry. These units of government have been involved in a type "co-management" in which authority for managing the resource is

shared between units of the government and the industry. If the experiences in the Maine lobster industry are any guide, co-management holds forth a good deal of promise for the management of natural resources.

Outline of the Book

Chapter 1 gives general background information on many aspects of the industry which are necessary to understand the information in the chapters that follow. This chapter includes information on the biology of the lobster, technology of lobster fishing, and the daily and annual rounds. It also contains a section on the range of variation along the coast, which has made it so difficult to formulate general laws for the state as a whole, and on the harbor gangs, the most basic social unit of social organization in the industry.

Chapters 2 and 3 describe the informal institutions and rules. Chapter 2 focuses on the territorial system and the factors underlying the changes in that system over the last century. Chapter 3 describes the development of informal trap limit rules on five islands, and the reason that these rules have been able to be generated here and not in mainland harbors nearby. The boundaries and limited entry rules associated with the territorial system are a necessary prerequisite for the development of trap limits.

Chapters 4 and 5 focus on the lobster conservation laws developed by the State of Maine, the political negotiations that resulted in these laws, and the underlying processes by which they were produced. Chapter 4 describes the development of major lobster legislation from the 1870's to the 1980's, including the size regulations and the prohibition on taking egged females. As we shall see, many, but not all, of these laws, came about in the aftermath of severe distribution

fighters within the industry. Chapter 5 deals with the Zone Management Law, a statute which changed many aspects of the way fishery is conducted. Most important, it established a co-management system in which the coast was divided into zones managed jointly managed by elected zone councils and the state government. This co-management system has been very successful, in that it has allowed the industry to get rules that it has long wanted. However, the zone councils have had to face a set of problems, not the least of which stemmed from the fact that the passage of a rule to solve one communal action dilemma caused a series of other communal action problems, which had to be solved in turn.

In the 1970's the first of a series of federal laws designed to manage resources was passed by the U.S. Congress. Chapter 6 covers the imposition of these laws on lobster management, and the actions of the industry to get rules they could live with. Special attention is paid to the difficulties of lobster management that occurred when the New England Regional Fisheries Management Council and the National Marine Fisheries Service were responsible for lobster management, and the reasons that federal management moved ahead faster when the Atlantic States Marine Fisheries Commission became the primary agency in charge of lobster management in federal waters. In dealing with the Federal government, the industry associations played a primary role.

Chapters 7 and 8 describe the problems of science in lobster management. Chapter 7 is devoted to explaining the difference in view of fishermen and scientists about the ocean and changes in lobster stocks, which causes such severe disagreements about the proper course of management. The politics of management is the subject of Chapter 8. It focuses on the scientific disputes behind the decades-long effort by scientists to get an increase in the 3.5 inch

measure, and the problems with efforts to model the fishery and predict changes in stock sizes and catches. These issues propelled science and scientists into the middle of a series of particularly nasty political brawls.

The conclusion attempts to synthesize what has been learned from this case study and the way in which it contributes to several bodies of knowledge.

The rising catch levels that have occurred beginning in the late 1980's has convinced the industry that their efforts to conserve the fishery have succeeded. However, this impression is not shared by the press and the public. Over the past fifteen years, a number of articles have appeared in the national press stating the industry is on the verge of disaster and predicting even more dire things to come. Stories with titles like "Where Have All the Lobsters Gone? (Keiffer 1993), "The Lobster Business is Going to Pot", a "A Tale of Two Fisheries" (Tierney 2000) present the demise of the lobster as due to massive overfishing.

By 2000, the idea that the lobster fishery was in deep crisis appeared to be a well accepted fact by the public. The Monterey Aquarium (California) put lobster on its seafood watch list advising the public to stop eating lobster because it was worried "about overfishing and that the fishery could be on the verge of collapse" (O'Leary 2000).

These disaster stories are traceable, in most part, the press and some of the government scientists. The press appears to love disaster stories, and this faction of scientists is all too happy to oblige it. The fact that the press and the scientists have presented the fishermen as a pack of villains who have overfished the lobster stock, while record high catches are being produced and members of the fishing industry have put a lot of effort into making various conservation efforts

work has done nothing to endear either to the lobster industry..

Notes

throughout this book I am using the terms "fisherman/men," "lobsterman/men," and "sternman/men" rather than "fisher(s)" or "lobster catchers." Although the majority in the industry are men, there are some women who have their own boats, and others who work as lobstermen on the boats of others. Men and women alike prefer to be called fishermen or lobstermen, not "fishers" or "lobster catchers." The term "fisher" has a negative connotation. A fisher is a fierce brown animal in the weasel family that has eaten many pet cats in Maine and regularly kills dogs.

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'Final: edited by Ann Dec 3, 2000: bibliography checked. biblio rechecked 2/25/01.

Bib corrected 4/27; Reviewers comments added 9/14/01

Chapter 1

The Maine Lobster Industry: General Information

More lobsters are caught in Maine than any other state in the United States, amounting to approximately 60% of U.S. lobster landings. Although 60% of the total North American lobster catch is landed in Canadian ports, lobsters are still strongly associated with Maine, and Canadian-caught lobsters are frequently marketed as "Maine lobster/" Since the 1950's, lobster has been the most valuable fishery in Maine. In 2000, lobster sales totaled \$186.1 million dollars.

Lobster fishing is not concentrated in any one area. Every harbor along Maine's convoluted coast has a few lobster boats, and most have a lobster dealer who buys from local fishermen. Lobstering has always been an inshore day fishery. Fishermen leave home in the early morning, spend the day fishing within a few miles of their home harbor, and return in the afternoon. Lobsters are caught in traps baited with low value fish.

In 1999, Maine issued approximately 7,700 lobster licenses (check). A typical full-time lobster fisherman has a 33 foot inboard-powered boat, which he uses to tend approximately 500 traps. Most fish alone or go with one helper. The lobsters are sold to private dealers who have docks in virtually every harbor along the coast or to one of the seventeen cooperatives. (Acheson 1988: 84-90).

Biology The American lobster (*Homarus Americanus*) is found in the waters off the Atlantic coast of North America from Newfoundland to Virginia. Although adult lobsters can be

found in waters ranging from 6 to 1200 feet deep, lobsters are most concentrated in coastal waters of the Gulf of Maine at depths less than 150 feet. Although lobsters live on all bottom types, they prefer areas with boulders, especially where there is a good deal of kelp in which to hide (Bologna and Steneck 1993; Cooper and Uzmann 1980). In the winter, many lobsters move onto muddy bottom where they can dig burrows in which to hide.

Lobsters grow when they molt. Early in their lives, they molt several times a year, while in later stages molting occurs only once a year or every other year. During molting or "shedding" the lobster shell splits along the bottom of the carapace, and the lobster wiggles out, leaving the shell intact. During the next few days the shell is very soft and the lobster is very weak. Just after molting lobsters feel like gelatin covered with a thin sheet of dark green paper. At this time, they can easily be caught and eaten by all kinds of predators, including other lobsters with hard shells. Just after molting, the only defense is to hide in the rocks. Within a few days, the shell begins to harden again, but for a period of weeks the shell is soft, rendering the lobster more vulnerable to predation and attack.. Although lobsters can molt in any month, the vast majority molt in the mid summer months. From approximately mid June to mid August the lobster catch is very poor since such a large percentage of lobsters are in hiding. It takes approximately seven years for a lobster to grow from larval stage to a carapace length (Cl, postorbital-to-posterior-edge measure) of 3.25 inches—the current minimum size that can be legally harvested in Maine.

The life history of lobsters has four phases (Steneck 1989): pelagic, benthic, adolescent, and reproductive phases. In the pelagic phase, they go through three larval stages and a swimming post-larval stage. During the first larval stage, they are almost translucent and the size of a ; in the swimming post-larval stage they have metamorphized into an animal about mm long. During these stages, they float through the water column for a period of several weeks

to over a month before settling to the bottom. What happens at the time of transition from water column to the bottom may be most critical to the life of the lobster. If temperature conditions are right and they happen to land on bottom with good habitat, large numbers survive; if the water is too cold, the larvae are in poor condition, or if they happen to land on bottom with poor habitat for lobsters, few survive.

In the early benthic phase, small post larval lobsters (about 0.2 to 1.6 in. CL) begin their life on the bottom. Adolescent phase lobsters are between 1.57 to 3.54 in. CL and vary in age from 3 to 10 years old. They forage actively at night and hole up during the day.

Lobsters in the reproductive phase (over 3.54 in. CL) become less dependent on shelter since they are subjected to far less predation. They can migrate considerable distances, and are most abundant (albeit in lower densities) in deep water and offshore areas. The large number of big lobsters offshore is not a function of heavy exploitation inshore (Skud and Perkins 1969). Lobsters can live for a long time. Females may be a decade old before they become sexually mature, and lobsters may live as long as 100 years (Cooper and Uzmann 1980).

In the Gulf of Maine, most female lobsters do not mature sexually until they are over 3.15 in CL (late adolescent phase), and 50% are not mature until they reach 3.5-3.7 in. CL (reproductive phase) (Krouse 1972, 1973). Fecundity increases with size. When females first become mature at 3.25 or 3.50 in. CL. they can extrude a few hundred eggs. A single large female (over 5 inches CL) can exude as many as 100,000 eggs. Males mature at much smaller sizes (1.8 to 2.8 inches CL. (Krouse 1972, 1973). Because an estimated 94% of all lobsters are caught in the year after they molt into legal size (currently 3.25 in. CL), and only an estimated 12% of female lobsters are sexually mature at this length, it follows that the vast majority of females do not survive to extrude eggs even once (Acheson and Reidman 1982). For this reason,

lobster biologists have long advocated raising the legal minimum size of lobsters (e.g. Thomas 1973). Lobsters mate right after mature females have molted when their shells are soft and they are defenseless. The male deposits sperm into her seminal receptacle, where it remains for up to a year until the eggs mature. Once the eggs are extruded from the female lobster's body they remain attached to her abdomen for a period of months until they hatch, usually during the following summer. Lobsters in this reproductive stage are called "berried" or "egged" lobsters.

Since lobsters require highly saline water, they are not found in numbers far up rivers or in estuarine areas with large influxes of fresh water. More than any other factor, the life cycle of the lobster is affected by water temperature. Temperature affects larval settlement, molting, migration, growth, and hunger, which, in turn, affects willingness to crawl into traps.

Lobsters are generally highly sedentary. The work of Brown and Harriman (1952) showed that the vast majority of tagged lobsters were caught within two miles of the place where they were released. However, more recent studies show that some "extensive localized movement occurs" (Krouse 1977:6). Under some conditions, lobsters migrate for long distances (Cooper and Uzmann 1971). In the Gulf of Mexico these migrations generally go in a southwest direction following the coastal currents. Moreover, Pezzack's (Pezzack and Duggan 1986) work shows that large lobsters generally migrate offshore into deeper water.

Lobsters eat a wide variety of food, including both living and dead organisms. Their preferred diet probably consists of small crustaceans, mollusks, and fish, although marine worms make up a significant part of the diet in some situations. Lobsters are also capable of filtering plankton from water, and thus can live in traps which have been abandoned for considerable amounts of time. Lobsters are also cannibalistic, and will attack, smaller, and soft-shelled members of their own species. This is particularly true of lobsters in captivity (i.e., in

traps, pounds, cars) where densities are high. For this reason fishermen put rubber bands around the claws of the lobsters they catch; and dealers separate out soft shelled from hard shelled animals, and remove injured lobsters.

Since only adolescent and reproductive-size lobsters are caught in traps, fishermen have a chance to learn about them. They have no opportunity to observe lobsters in earlier stages.

The Region

Socially and economically, the Maine coast varies widely from one region to another. The communities on the western coast of Maine, adjacent to the New Hampshire border, exist in an area that is densely populated, urbanized and highly industrialized. This region is an extension of the "northeast corridor" that extends from south of Washington, D. C. to the area north of Portland, Maine. There are people living in the area around York and Kittery Maine who commute daily to Boston which is about 55 miles away. Portland with 80,000 people, is the largest city in the state, and home to a number of high tech industries. Fully half of the population of Maine lives within 30 miles of Portland. In this region, the population is relatively wealthy, younger, and better educated. Alternative economic opportunities are good, and the unemployment rate here has long been the lowest in the state. This region has experienced a good deal of population growth, accompanied by substantial suburban development. On every road throughout the region there are houses and housing development. The population in this region is well served by shopping malls, transportation facilities and professional services. Here, fishing families are a very tiny percentage of the entire population, and only a small proportion of the income of the region comes from the fishing industry.

Along the western coast, harbors are fewer and poorer in quality than they are elsewhere in the state. Since there are many miles of sand beach, the coastline is far less convoluted, and

protected harbors are at a premium. Large numbers of tourists are attracted to this region, and there is a highly developed infrastructure catering to them. Every port in the region is crowded with motels, restaurants and shops, and the harbors themselves are surrounded with marinas, yacht clubs, and boatyards. Every mile of shore is lined with cottages and houses.

By way of contrast, the eastern coastal region, adjacent to New Brunswick, is largely rural, unindustrialized and sparsely populated. It has long been an economically depressed area from which people have steadily emigrated for the last century. Economic opportunities, especially in Washington County on the New Brunswick border, have long been poor and unemployment is high. In this region, it is common for people to piece together a living over the annual cycle by combining a variety of jobs such as clamming, cutting pulp wood, making Christmas wreaths, and collecting unemployment insurance payments. Communities are small, far apart, and relatively isolated. In traveling between towns, one encounters few houses and a lot of woods. Most fishing communities are largely lacking in shopping facilities and other services. Here it is common for people to travel over 100 miles to Ellsworth or Bangor to go to the doctor or stock up on supplies.

In these eastern communities, the fishing industry is the single most important source of income. In many harbors, lobster fishing is the backbone of the local economy, and more people are employed in this industry than in any other single occupation. Boat building has long been a major activity in many of the harbors in the eastern part of the state, especially in Jonesport-Beals which supplies many of the lobster boats for the entire state. Here, people will often fish from May to late fall and devote the winter to boat-building. For reasons that are unfathomable, relatively few tourists find their way beyond Bar Harbor (Mt. Desert Island) to this spectacularly beautiful eastern coastal region. Some coastal towns have no motels, shops or restaurants at all.

There are miles of shoreline on the mainland that have few cottages if any at all.

The eastern coast is blessed with an abundance of protected harbors, None of these ports is very large. In this region, the largest fishing communities are Stonington with ??? people and Jonesport with a population of ??????. The harbors of these communities are dominated by the fishing industry. Each harbor has dozens of lobster boats, along with one or more lobster dealerships, boat yards, and perhaps a fish processing plant. Yachts, recreational boats, and the facilities to service such craft are scarce.

The central region (often referred to as the mid=coast) stands between the western and eastern regions in most respects. It has a sparser population, less industry and less urbanization than the western counties; but it is far less rural, more densely populated, and more industrial than the eastern coast. In age structure, educational levels, and income the region is also intermediate. Along the central coast, fishing communities are small villages located on the peninsulas that dominate the coast. However the region does have a number of small cities along U.S.. 1, including Bath, Rockland and Belfast which can be reached in less than an hour's drive from the coast. Employment opportunities are better than in the eastern region, with large numbers of people employed in Belfast at MBNA, a credit card company, and at the Bath Iron Works, which builds warships for the U.S. Navy.

Table 1.1 Demographic Characteristics of Maine's Coastal Counties

	1990	1990	1999 Average
	Population ^a	Pop/Sq.Mile ^a	Unemployment
			Rate (%) ^b
York	164,587	166.1	2.9
Cumberland	243,135	291.0	2.3
Sagadahoc	33,535	132.0	3.0
Lincoln	30,357	66.6	2.9
Knox	36,310	99.3	3.0
Waldo	12,658	60.5	4.4
Hancock	46,948	29.5	5.3
Washington	35,308	13.7	8.8

^aSource: 1990 Census of Population and Housing — CPH-4, Population and Housing Characteristics of Congressional Districts of the 103rd Congress, Table 5 (<http://www.census.gov/prod/1990dec/cph4/tables/cph4tb21/cph4tb21.htm>)

^bSource: Maine Department of Labor, Division of Labor Market Information Services, in cooperation with the U.S. Bureau of Labor Statistics, (<http://janus.state.me.us/labor/lmis/reports/edrg/mecty99.html>)

Harvest History: Bust and Boom

Maine lobster catches have varied greatly over the past 120 years (Table 1.2). Between 1880 and 1912, they ranged from a low of 11.1 to a high of 24.5 million pounds (Maine Department of Marine Resources 1995). After World War I, catches dropped precipitously, and

remained low until World War II, forcing large numbers of fishermen out of business.

Throughout the lobster "bust" of the 1920's and 1930's catches hovered between 5.5 and 7.1 million pounds annually (see Table 1.2). From 1947 to 1988, catches were considerably higher and very stable, averaging about 20 million pounds.

Since 1990, lobster catches have steadily increased, and have been over 30 million pounds every year. Since 1994 they have been around 40 million pounds, and in 1999, the Maine catch had risen 53.1 million pounds; and by 2000 catches totaled 56.7 million pounds. In summary, at the present, the lobster industry is experiencing a boom. Catches have never been so high at any period. However, it should not be forgotten that there was a severe lobster stock crash in the years of the "lobster bust," in the 1920's and 1930's. There is no consensus on the reasons for either the "bust" or the "boom", and, as we shall see, this has had an effect on policy.

Table 1.2 Official state figures on lobster catch, trap numbers and license numbers, 1880-1999

Year	Catch (lbs)	No.Traps (thousands)	No. Licenses
1880	14234182	104	2763
1886	23004765		
1887	22916642	109	1906
1888	21694731	107	1967
1889	24452111	121	2080
1890	20001555		
1892	17642677	153	2628
1894		200	
1897		234	2436
1898	12267498	279	3103
1899	12718136	335	3116
1900	14406201	327	3105
1901	13982964	304	2788
1902	14324348	298	2541
1903	13115709	268	2558

1904	12083554	264	2509
1905	11137947	256	2562
1906	15014147	305	2672
1907	17397342		
1908	17635980		
1909	16954270		
1910	19936542		
1911	16189224		
1912	16298370		
1913	8116776		
1914	8632915		
1915	11535800		
1916	10155047		3291
1917			
1918			
1919	5793784		3867
1920			
1921			
1922			
1923			
1924	5513002	154	
1925			
1926			
1927			
1928	7100332	211	
1929	6620615		
1930	7750682	205	
1931	5365466	168	
1932	6056932	208	2927
1933	5897685	180	2956
1934	5377278	183	2925
1935	7687200	185	3102
1936	5120386	185	
1937	7348500	186	
1938	7659200	258	3592
1939	6625409	260	3722
1940	7643005	222	3717
1941	8937182	194	3648
1942	8403793	187	3511
1943	11468025	209	4239
1944	14056795	252	4926
1945	19129019	378	6241
1946	18755798	473	6574
1947	18277093	516	5338

1948	15923053	439	5345
1949	19267000	462	5424
1950	18346000	430	5152
1951	20750000	383	4653
1952	20027000	417	5032
1953	22286000	490	5497
1954	21638000	488	5794
1955	22705000	532	6051
1956	20523000	533	5492
1957	24293000	565	6068
1958	21301000	609	6236
1959	22317000	717	6488
1960	23999000	745	6636
1961	20904000	752	6472
1962	22068000	767	5658
1963	22798000	731	5695
1964	21407000	754	5803
1965	18857000	789	5802
1966	19910000	776	5613
1967	16483000	715	5425
1968	20497000	747	5489
1969	19829000	805	5750
1970	18167000	1180	6316
1971	17552000	1278	6702
1972	16252000	1448	7045
1973	17039000	1172	7894
1974	16452000	1790	10525
1975	17012000	1771	10455
1976	18996000	1750	9041
1977	18482000	1739	8827
1978	19126000	1723	8712
1979	22130000	1810	8600
1980	21971000	1846	9200
1981	22591000	1825	8548
1982	22833000	2143	8891
1983	21967000	2340	8895
1984	19538000	2175	8730
1985	20184000	1766	7879
1986	19703000	1995	8875
1987	19732000	1909	8730
1988	21656000	2053	8804
1989	23477000	2001	7215
1990	28076000	2130	6708
1991	30836000	2015	6940

1992	26879000	2012	6162
1993	29976000	1806	6176
1994	38951000	2356	6503
1995	36525825	2408	7690
1996	36222628	2605	7010
1997	47022555	2590	6400
1998	47030750	2825	6863
1999	52614536	3043	6704

Note: 2000 figures are 57.4 million lbs caught, 2,780,000 traps; and 6884 licenses issued.

From 1930 to the present, there has been a steady increase in the number of traps used. Whereas 1931 saw only 210,000 traps in the water, fishermen in 1999 used 3,043,154 traps, an increase of over 1400%. (Table 1.2). This increase in the number of traps was made possible by a number of innovations over the past 50 years (Acheson 1988). Lobster boats are larger, and their engines are more powerful, making it possible to fish a much larger zone throughout the entire year and to carry more traps. The advent of the hydraulic trap hauler in the 1960's made it possible to pull more traps in a day, while the adoption of more durable nylon heads in the late 1950's increased the number of traps one could use by reducing maintenance. Last, the widespread use of electronic navigational devices such as Loran C, and more recently GPS (geographic positioning systems), has made it possible for fishermen to find their gear more easily, especially in foggy weather. In short, people can use more traps because they have to spend less time building, repairing, transporting, and finding their gear than previously.

At the same time, the number of lobster licenses has remained far more stable. From 1900 to 1930, the number of lobster licenses ranged from a low of 2,541 in 1902 to 3,291 in 1916. From 1950 to the present, the number of licenses ranged from a low of 4654 in 1951 to

10,455 in 1975 with an average of 6,721.

Boats, Traps and Electronic Gear

Lobster boats and the equipment on them are relatively homogenous. Most full-time fishermen use boats 33 to 38 feet in length which they operate alone or with the assistance of one helper, called a sternman. There are some very real limits on the size of lobster boats. Boats under 26 feet long cannot carry many traps and are uncomfortable and even dangerous to use in rough water. Vessels over 42 feet are inefficient. One can pull the same number of traps from a 30 foot boat, with far less cost in gas, maintenance, and boat payments. Boats over 40 feet long are, however, commonly used by people regularly fishing offshore areas such as Cashes Ledge.

Fifty years ago, virtually all full-time fishermen used wooden boats, powered by inboard gasoline engines. Since the 1970's, diesel-powered boats with fiberglass hulls have become increasingly common. Fiberglass boats are easier to maintain, while diesel engines last longer and run up smaller fuel bills than gas engines.

Boats are usually equipped with a compass, hydraulic hauler, a VHF radio, a depth finder, Loran C, and containers for bait. Most are equipped with flowing sea-water tanks or barrels. Such storage tanks are especially important in the summer, when hours of exposure to warm air can debilitate or kill soft-shelled lobsters. Increasingly, full-time fishermen use radar, and GPS systems.

Since lobstering is a day fishery, lobster boats are not generally equipped with bunks, galleys, tables, heads or other facilities which would make it possible to live on the boat for a period of days.

Many part-time fishermen use boats which are virtually identical to those used by full-

timers. Others use outboard-powered skiffs ranging from 14 to 20 feet long. These skiff fishermen normally fish only in the summer months in sheltered bays and inlets near shore.

Lobster traps are uniform along the entire coast. Traps are either made of wood or wire. Since the 1970's the traditional wooden traps have been increasingly replaced with wire traps, which catch more lobsters (Acheson 1980). Today, the vast majority of traps in use are four feet long and made of vinyl-covered wire. Both wire and wooden traps are equipped with a funnel shaped "head" made of nylon netting, designed to make it easy for lobsters to enter traps, but difficult to find their way out. Usually two sets of heads are used: one placed across the opening to the trap, and another across the center of the trap. Traps are held on the bottom by various kinds of weights. Lobsters are attracted into the traps by bait which consists of dead fish. Virtually every kind of fish and fish remnants have been used to bait lobster traps. In past decades, the most common type of bait was fish frames from fish packing plants; for the past twenty years, the most common bait has been herring remnants, which are placed in bags (so called "bagged bait") and tied in place.

Lobster traps are attached to a Styrofoam buoy which floats on the surface by a rope made of nylon or polypropylene, called "warp," which is usually measured in fathoms [i.e., 6 foot increments]. Most fishermen use toggles, made of bottles or Styrofoam, to keep the warp line off the bottom where it might be entangled. The length of the warp varies from 10 fathoms to 60 fathoms depending on the depth of water in the location being fished.

Loran and electronic sounders have made it easier to locate traps and learn the bottom (Acheson 1988: 84-90).

Conservation Laws

In Maine, one must have a license to fish for lobsters. The basis of lobster management

has long been a prohibition against taking size limitations and regulations designed to protect reproductive or "berried" (egg-bearing) females. At the present time, it is illegal to take lobsters under 3.25 in. CL and over 5 in. CL, a form of "slot limit," called the double gauge law. The minimum size measure protects the juvenile lobsters, and the oversize or 5 inch law protects the large reproductive-size lobsters. One cannot take "egged" or "berried" lobsters. Another law designed to protect the reproductive stock is the "V-notch" law. Fishermen catching a berried lobsters may voluntarily cut a notch in one of the side flipper of the tail [telson]. Such "V-notched" lobsters cannot be taken by any one else as long as the notch lasts [at least two molts]. The V-notch law has received massive support from the industry, with the result that there are very large numbers of V-notched females-proven breeding stock-in the Gulf of Maine.

In addition, there are a number of laws pertaining to capture techniques. The most important of these is that lobsters may only be taken in traps, which are a highly selective gear. One can pull a trap to the surface, select out the undersize, egged, V-notched and over size lobsters. These prohibited lobsters can be put back in the water and float back to the bottom unharmed. In addition, traps must have a state-issued trap tag with the fisherman's number. Moreover, each trap must be equipped with an escape vent 1 15/16 inches to allow sub-legal lobsters to escape. They must also have a bio-degradable panel, designed to self destruct over time, to prevent lobsters from being trapped for very long periods in lost or "ghost" traps.

In 1995, the legislature passed the zone management law, which greatly changed many aspects of lobstering. This is a true co-management law, giving the industry control over some important aspects of management. This law divided the coast into zones run by zone councils elected by lobster license-holders. Under this law, an apprenticeship program has been established for the state, and different trap limits and limited entry regulations have been

established in different zones.

Most important, all of these laws are the result of lobbying activity by the lobster industry over the course of the past 120 years. All of these laws are strongly supported by the lobster fishing industry.

Weather

At any time of year, Maine weather is highly variable. Nice days will be followed by days with overcast skies or storms at unpredictable intervals. It can be very nice in the morning, and turn very nasty by afternoon. Fishermen must always keep a "weather eye out." Sometimes a weather pattern will become stalled over the area, bringing the same kind of weather for days on end, but such situations are rare. In Maine the old truism hold: "If you don't like the weather, stick around for a few minutes."

Summers weather generally makes fishing relatively easy. Day time temperature ranges from the high 60's to the low 80's, while at night it drop into the 50's or low 60's. For this reason, the Maine coast has long been a haven from the city heat for large numbers of people from the cities of the eastern seaboard. Every summer, however, sees a number of days in the high 80's and 90's with very high humidity. On these days, care needs to be used to keep lobsters in seawater since they are easily are killed by high temperatures. Many summer days begin with fog, making it difficult to find buoys, and the afternoons can end with severe thunder storms with high winds, making it advisable for boat crews to be ashore if at all possible.

Late August and September brings a number of "state of Maine days", crisp, clear weather with stiff winds coming from the north and west. If the winds make pulling traps more difficult, they produce some of best sailing days of the entire year.

As summer turns to fall, the weather turns colder, turning the leaves on deciduous trees a

riot of colors. The height of the "foliage" season is generally around October 10th along the central coast. As fall progresses, stormy and windy days become more common, and nighttime temperatures are increasingly below freezing. Some time between Thanksgiving and Christmas, snow will fall, sometimes remaining on the ground until March.

The deep winter months of January and February bring the worst fishing weather of the year. This is a time of severe storms, with high winds and rough seas lasting for days. Sometimes the weather is so bad that boats cannot get out for a week or more. The coast, however, does not generally get as much snow accumulation as the interior. On most days, the temperature is in the 20's, but days in the low thirties are far from rare. Rain and ice storms are all too common along the coast, and the snow that does fall is apt to be heavy and sticky.

The end of March and the first part of April is mud season. At this time the frost is coming out of the ground, making it soft and filling unpaved roads with puddles and ruts. The melting snow invariably causes floods. While flocks of birds have begun to return, no plants have begun to turn green and patches of dirty snow remain everywhere.

Along the coast, warm weather begins in the first two weeks of May. By mid May, buds are on all of the trees; some flowers are in full bloom, and it is safe to plant a garden. But it is not really until the end of May or the first week of June that summer weather returns.

Throughout the year, the huge body of water in the Gulf of Maine exerts a moderating influence on the weather. The coast is cooler in summer and warmer in winter than inland areas. In winter, rain on the coast is often snow just 10 miles inland. In summer, one can normally find quick relief from 90 degree weather inland by going to a coastal beach a few miles down a peninsula.

Annual Round

The activities of lobster fishermen vary greatly from one season to another. The patterns of fishing activity are influenced by the biology of the lobster, the weather, involvement in other fisheries, and markets.

From the middle of January to mid March, lobster fishing is at its annual low point. Winter storms with high winds last for days, destroy a lot of traps, and make it very difficult to pull traps often. Moreover, traps are relatively unproductive at this time of year, since the low water temperatures make lobsters inactive and thus far less likely to be caught. Since the best fishing at this time of year is in deep waters three to ten miles from shore where inversion layers keep the water relatively warm, fishermen must spend a lot of time getting to and from the fishing grounds, where they are exposed to the full force of the wind. The only attractions of winter fishing are the fact that the price of lobster is at its annual high, and gear tangles are less likely since there are few traps being fished. Despite the high price, many fishermen have only a small number of traps in the water which they pull only a few days a month when the weather permits. Others quit lobster fishing entirely. Some go shrimping or scalloping, while others devote most of their time to building traps and repairing gear for the next season.

As the water begins to warm in the middle of April, lobsters become more active and begin to migrate towards shore. As the weather improves, fishermen place more traps in the water, and pull them more often. The month of May sees both an increase in catches and in traps hauled. Unfortunately, prices usually drop precipitously in May due to a short term glut of lobsters.

Catches fall dramatically during June and July because large numbers of lobster are molting at this time and are hiding in the rocks. At this time, many fishermen take all of their traps out of the water and spend their time painting their boats and repairing their gear.

During late July and early August the fishery picks up momentum. More lobsters are available since a new year class has molted into legal size, and lobsters are active in the warm water. Moreover, the price of lobster is relatively high because of the increased demand at the height of the summer tourist season. At this time, the weather is usually cooperative and only rarely do fishermen lose days due to storms. Fishermen put more of their traps in the water and fish them hard. One of the few negative sides of the summer fishery is congestion. Since large numbers of lobsters are in shallow water, almost all traps are crowded together in the narrow band of water close to shore or near shoals. Congestion is further increased by the large number of skiff fishermen who enter the fishery at this time of year.

The fall and early winter are the most productive time in the lobster fishery. Catches are very good at this time of year, and fishermen generally put out all of the traps they own. Many sternmen during this period. Between late August and November, approximately two-thirds of the entire year's catch is produced. Unfortunately, immediately after Labor Day, prices generally fall to their lowest levels of the year due to high supply and lowered demand as the tourist hordes leave Maine. At this time, very large numbers of lobster are bought by pound operators, who store them for a few months and then make their profit on the annual price rise.

As fall progresses, the weather gets increasingly stormy, and by November fishermen are beginning to be forced to stay ashore on bad days. However, there are compensations for the worsening weather. The price of lobsters usually rises steadily throughout the fall. Moreover, trap congestion is less because lobster begin to move into deeper water where there is more space to fish, and the storms have driven people with skiffs or small inboard-powered boats from the fishery.

Late in December and early in January, the water cools, catches decline, and fishermen

pull all or most of their traps out of the water. Those who remain in the fishery place their traps in deep water and do not pull them often.

Three patterns should be noted concerning the seasonal cycle. First, fishermen place traps where large concentrations of lobsters are found: next to shore in the warm summer months, and in deep water miles from shore in the winter. Second, prices vary inversely with catches over the annual cycle. The price reaches its annual low in the late summer and early fall when catches are very high and demand is low due to the scarcity of tourists. In mid winter when catches are very low, the price reaches its annual high. Third, the efforts of fishermen are driven more by the availability of lobster than by price. Fishermen maximize effort in late summer and early fall when potential catches are high, and reduce it in the winter when they are low. The reason for this pattern relates to the revenue to be earned. A fisherman makes more money in the early fall, when, despite the low price, he can catch hundreds of pounds of lobster a day, than he does in mid winter when a whole day's fishing might net only a few dozen lobsters.

The Daily Round

A lobsterman's day begins the night before when he decides if the weather will allow him to go fishing or not. If a storm threatens, he may devote the day to doing tasks ashore or running errands in one of the nearby cities. If he decides to go fishing, he will rise very early in the morning, typically before sunrise, drink a cup of coffee, grab his lunch and leave for the dock where his boat is moored. Many lobster fishermen live within a few hundred yards of the harbor; others have to drive for a few miles.

When he reaches the dock, he rows out to his boat in a small skiff, puts the skiff on the mooring, puts on his boots and foul weather gear, starts the engine, and casts off. He may tie up to the dock for a few minutes to take on gas or bait, if he has not done these chores the night

before.

The fisherman leaves the harbor at high speed, motors roaring and wake churning out behind. In the warm months of the year, when traps are located near shore, he may arrive within a few minutes at the first set of traps. In the winter months, when traps are generally in deep water, he may have to travel as much as an hour or more to get to his strings. When he arrives at the first trap, the engine is cut, and the buoy or toggle is pulled into the boat with a gaff. The warp, or rope tied to the trap is engaged in the wheel of the hydraulic trap hauler, which pulls the trap to the surface rapidly. As the trap comes to the surface the warp piles up in the working area of the cockpit, literally around and under the fisherman's feet, drenching the deck and cockpit with seawater and slime. When the trap emerges from the water, the fisherman stops the hauler, pulls it into the boat, and puts the trap on the side or "rail." He quickly unfastens the small string that holds the door of the trap shut, and takes out the lobsters. Those V-notched, and oversize and those clearly under the legal minimum are thrown overboard with scarcely a glance. Those that are likely to be legal are usually put in a bucket temporarily. Then the fisherman takes out the used bait and the other animals that may have entered the trap, such as sea urchins and crabs, and throws them overboard. He then baits the trap by tying a bait bag filled with fish remnants, or fish frames, inside the entryway of the trap, and the trap's door is tied shut. The fisherman then steers the boat to the place where he intends to place the trap, and pushes the trap overboard. In placing traps he pays special attention to the sonar to help find the depth and bottom type where he believes concentrations of lobsters are found, and the placement of other traps with which he might become entangled. Increasing speed, he heads for the next trap, taking great care not to become entangled in the warp and buoy that are flying out the stern of the vessel, attached to the sinking trap. If the fisherman is fishing doubles (two traps on a line)

or "trawls" (multiple traps on a line), all of the traps attached to one warp line are pulled, cleaned out, rebaited, and set on the rail. When doubles or trawls are set, the first trap is pushed overboard, and the remaining traps are then pulled off the rail after the moving boat.

Between traps or strings, the fisherman measures the lobsters he believes are over 3 1/4 inches on the carapace (eye socket to the back, see figure) using a brass gauge purchased from the Department of Marine Resources. The ones that prove to be too small are thrown over the rail. The legal-size lobsters are placed in storage containers, after their powerful crusher claws have been immobilized, by "banding" or placing a large elastic around the claw. This is done to prevent cannibalism and to protect anyone who must handle the lobsters. Fishermen store their catches on board by placing them in crates or bushel baskets, or by putting them in barrels filled with running sea water.

The sternman's job varies somewhat depending on how many traps are on a line. If they are fishing "singles," the sternman may do nothing but keep bait in the "bait bags" or on the baiting iron, band the caught lobsters of legal size and put them in a storage tank. If they are fishing doubles or trawls, it is common for the fisherman to clean and rebait the first trap pulled, while the sternman does the second trap.

The fisherman and his sternman pull trap after trap throughout the day, going through the same procedure each time until between 200 and 600 traps have been tended. The work rarely stops, and what little conversation this is concerns the work at hand. Many crews do not even stop for lunch, but drink a cup of coffee and eat a sandwich between strings of traps.

Only a few things alter the daily routine. After a storm, fishermen usually have to spend time untangling gear. Two or three times a day, fishermen will move traps from areas which have become unproductive to those where lobsters are concentrated. In the warm months of the

year, barnacles and plant growth have to be cleaned from buoys and warp lines by dunking them in a tank of water heated to the boiling point by the engine. A few times a day, fishermen will make minor repairs on a few traps.

To the casual observer, lobster fishing consists of nothing but a dull, unimaginative routine in which one pulls the same traps day after day. To the fisherman, maneuvering the boat and pulling traps are simply mechanical tasks performed more or less automatically. He must also recall the locations of the hundreds of traps in dozens of strings spread over many miles of ocean. In addition, he must concentrate on the far more important job of deciding where to place traps to maximize catches and minimize the probability of losses and entanglements. This means he must understand when and where traps will do well and the circumstances that will cause them to be unproductive. This takes skill and experience.

After the last trap is pulled, the fisherman heads his boat for the harbor at high speed. While under way, the fisherman or his sternman will begin cleaning up the boat, which is well begrimed with seaweed, slime, and an assortment of marine plants and animals. Most of the cleaning is done by scrubbing with a stiff brush and hosing off the dirt with seawater. Accumulated debris is shoveled over the side.

Upon reaching the harbor, the fisherman goes directly to the wharf of the dealer or cooperative to sell his catch. The lobsters are first weighed by the dock attendant or manager, then packed in crates, which are put in a floating storage box or "car." While at the dock, the fisherman will also refuel his boat and put bait on board.. Some dealers pay their fishermen in cash, but more often they issue a receipt and pay by check through the mail. He then puts his boat on the mooring, rows to shore, and goes directly home. Ordinarily there is little tarrying on the dock after a long day of fishing.

Men may do an errand or two concerning their fishing business after arriving home. After supper they may call a friend or two to check on prices, and the events of the day. Once or twice in the evening they will check on the weather.

The daily round varies somewhat with the seasons. During the fall season, many fishermen may work from dawn to dark. But ordinarily a fisherman arrives home in the middle or late afternoon after only six to nine hours on the water. At all times of year, men strongly prefer to start and end the day early to take advantage of the fact that it is normally much calmer in the early morning hours and becomes windy and rougher as the day goes on. Rough weather increases the difficulty of finding and rebaiting traps. This means they try to be on the water just after daybreak. Many will begin fishing at 7:00 A.M. in the winter, and around 4:30 A.M. in the summer months.

How many traps a fisherman has in the water and how often he pulls them varies seasonally. In the summer, lobster fishermen usually have their gear divided into two or three "gangs," which are located in different places and pulled every few days. In the late summer of 2000, one Pemaquid Harbor fisherman, who was fishing 600 traps in "pairs" set up the following ideal schedule for himself. He said he tried to pull 300 traps on Monday, and the same traps again on Thursday. On Tuesdays and Fridays he would tend the other 300 traps. Wednesdays were ideally devoted to business matters and maintenance, and the weekends he spent with the family. These traps are fishing for three or four days before they are hauled.

In the winter, fishermen have fewer traps in the water and have to leave them in longer. One fisherman in January of 2000 had three hundred traps in the water, which he was fishing in pairs. He tried to pull them about once a week depending on storms. On occasion, he could pull all of them in a day, but usually it took a day and a half or two days to tend all of his gear.

Skill

To be a successful lobster fishermen, one must have a combination of skills and knowledge. In addition to the skills involved in piloting and the operation of electronic devices such as Loran and radar, one must know how to maintain one's boats and equipment, business skills, and a knowledge of the ever-increasing number of federal and state regulations governing the operation of vessels and lobster fishing. One's safety at sea, even one's life, depends on seamanship, the ability to operate lobster gear without getting entangled and hauled overboard, and some knowledge of the weather. One must also learn enough about marketing to avoid being victimized by a dealer.

But the most important skill is the ability to catch lobsters. This involves a knowledge of the behavior of lobsters, locations where they can be caught which change over the annual round, and a detailed knowledge of the underwater geography. In this world, generalizations count for little. The kind of knowledge one needs is detailed and fine grained. Conversations among lobster fishermen revolve around discussion of bait, trap types, lobster movements, and subterranean tours of specific mud holes, gravel edges, ledges and other features of the bottom.

Adding to the complexity of the problem is the fact that lobsters migrate seasonally; and they tend to be concentrated in certain locations and eco-zones, which vary from one year to another. For this reason, lobster fishermen must be adept at learning where concentrations of lobsters are. This involves not only a knowledge of where lobsters were caught in years past, but the ability to learn by constantly experimenting with traps placed in various location. Of course, finding an exact location on a flat, undifferentiated ocean is always a problem.

There is a good deal to learn and there are impediment to the learning what one needs to

know. One is that it is always more difficult to learn about the behavior of animals that cannot be directly observed on the bottom of the ocean. Another impediment is that knowledge of lobster behavior, fishing bottom, etc. is very valuable, and consequently is kept secret by many men. Fishermen can be quite guarded in the information reveal about the factors influencing lobster behavior or influencing catches. Some will convey a lot of information to younger kinsmen whom they want to help, and others will only talk to other fishermen who can be counted on to give valuable information in exchange for what they get.

Two sets of technical factors make it easier to learn lobster fishing. In the past, a crucial component was a knowledge of how to build traps that attract and retain lobsters. This skill is becoming less important as more fishermen are purchasing their traps from trap manufacturers. Second, the advent of radar, loran, GPS systems and sonar have made it easier to navigate safely in fog, find specific locations, and learn the bottom.

Newcomers to the industry have a good deal to learn. Usually people become reasonably adept at catching lobsters within three to five years. Some never seem to learn, and remain poor fishermen for decades. A few become very skilled. In every harbor, one hears apocryphal stories of individuals who can outfish anyone, even with an old boat and a small number of traps. The difference is that skilled men can place traps consistently in certain micro-ecological niches where lobster are concentrated; the unskilled people place traps in a var more random fashion. One older fisherman has repeated said that "the good fishermen know how to make traps count; the kids are just throwing them all over the bay."

How much are skills worth? This is a difficult question to answer because it is difficult to separate out the effect on catches of skill and knowledge from capital and effort. Two different studies in which the data were analyzed by multiple and bivariate regression analysis

showed that skill was a significant variable in explaining catches and incomes (see Acheson 1977; 1980; 1988: 163-164).

For our purposes skill is important for two very different reasons. First, in all discussions of effort control, one has to recall that skill can be substituted for effort and trap numbers. Laws to control the number of traps people fish or the length of time they fish may not reduce lobster catches at all. Second, people who are highly skilled at catching lobsters usually have a good deal of influence which can be used politically.

The Social Environment

Lobstermen often present themselves as independent entrepreneurs who are beholden to no one. In fact, they are a part of a complicated sub-culture and social structure. To succeed in lobstering, one must not only have the right technical skills and work hard, one must be able to operate in a particular social milieu. The industry has rules all men are expected to obey, its own standards of conduct, and its own mythology.

Lobster fishermen are first and foremost members of families and communities. For many, the town contains the most important social units in their lives. Most of the important social contacts are within towns and the attention of the inhabitants is focused on their home communities to a large extent. It is no exaggeration to say that much that gives life its meaning is tied up with the local community and the social units it contains.

Much of the social life of such communities is focused on voluntary associations: churches, recreational clubs, fraternal orders.

But the most important social units are families. With every community are a number of old established families with histories in the local area that, in some cases, go back before the

American Revolution. Members of these families have known each other for decades and have intermarried for generations. These kin groups are very large and involve a thick network of kinship ties. Kinsmen work together, cooperate in a variety of endeavors, and visit back and forth constantly. In addition, membership in these families gives one very tangible assets. For our purposes, two such assets are especially important. First, politicians from such families, if they are at all skillful, can use kin networks to martial substantial political support in the local community. Second, members of such families are able to enter harbor gangs far more easily than others (Acheson 1988: 35-42).

Beyond the realm of kinship, some of the most important people in a lobster fisherman's life are the men who fish from the same harbor. Such social groupings, while they are recognized by everyone in the lobster-fishing industry, have no universally accepted name. People refer to the "Stonington Bunch" or the "Monhegan fishermen" or the "Portland Gang." I have referred to these groups as "harbor gangs," although this term is only rarely used by the fishermen themselves (Acheson 1972). [In Maine parlance, the term gang does not connote a criminal conspiracy as it does in much of the rest of the country. It is a synonym for group or set.]

Many aspects of the environment within which a lobster fishermen works are influenced by membership in a harbor gang. Fishermen identify with a particular harbor gang and are identified as members of it. Members of harbor gangs obtain a great deal of valuable information from one another on fishing locations and innovations. They also depend on each other for assistance in times of emergency at sea. This is one of the reasons that people in a harbor gang keep their radios on the same channel. Perhaps most important, lobstering is territorial; membership in a harbor gang gives access to lobster fishing territory. This will be

discussed in detail in the next chapter.

Harbor gangs are also reference groups. It is the yardstick by which one measures success. A lobster fisherman competes with members of his own gang. A person is a good fisherman or a bad fisherman in comparison with others in the local lobster fishery. The opinion of people in different harbor gangs does not count for much, because people from different harbor gangs do not know each other that well. Furthermore, lobstermen do not compare themselves to skippers of scallop, groundfish, or herring boats even though they might live in the same town or next door. Such men are in other fishing industries and are playing a different game by different rules.

Lobster fishermen in the same harbor gang ordinarily have long-term, multi-stranded ties with one another. Most live in the town where the harbor is located. Many are members of long-established families with a variety of kinship ties to each other. Members of harbor gangs in the same generation have grown up together, have gone to the same schools, and have been members of the same teams and clubs.

Every member of a harbor gang knows every other member by sight and reputation, regardless of their degree of interaction. In the smaller harbor gangs where there may be no more than ten or a dozen fishermen, all of them might interact with all others several times a week. In the larger gangs, which include more than 100 men, members might go weeks without seeing other members.

Interaction between lobster fishermen in the same harbor can be very intense. This is particularly true in the small, isolated fishing villages along the central and eastern Maine. Lobster fishermen meet on the dock before and after fishing. In those harbors with cooperatives, they meet at co-op meetings. Some harbors have formal meetings of lobster fishermen to discuss

events of mutual concern. They meet around town. At sea, some will talk several times a day to their friends, who are usually from the same harbor gang.

Within each gang, small cliques of friends and relatives form. They lend each other tools, help each other with tasks requiring group effort such as launching a boat, and sometimes help each other do jobs such as paint buoys or build traps. During these work stints, the men are constantly talking, joking, and swapping information of professional interest. In many instances, their wives get to be good friends as well so that two or more couples might occasionally go out to eat or dance, and in a few instances even take vacations together. In one community studied, a large sample of fishermen were asked to name their "best friends." Of the 133 lobster fishermen interviewed (owners and stemmen), eighty-seven named another lobster fisherman in the same harbor gang.

In many harbors these ties tend to form among men fishing from the same dealer or cooperative dock. Some dealers and cooperatives provide a place for their fishermen to sit, talk, and drink coffee. Such places serve much like a clubhouse for the fishermen who deal there.

The amount of interaction among fishermen varies considerably. Some fishermen spend hours each day hanging around the wharfs, visiting each other's homes and fish houses, and talking to each other on the radio at sea. Others remain quite solitary. These men do not tarry long on the docks; they get their gas and bait, sell their lobsters, and leave. Nor do they talk much on the radio. As might be expected, some of these men are relatively marginal to the gang, but others are very popular and are considered to be important members.

In the small gangs, fishermen know a good deal about each other's behavior and monitor each other constantly. In the larger gangs, the scrutiny is less intense, but fishermen are never completely anonymous and have difficulty keeping their actions completely secret. At sea it is

easy to see what boats are doing if they are within a mile or so. However, boats that are two miles distant are far more difficult to observe. Fishermen can sometimes use various ruses (e.g., raising a sail of a different color) to temporarily disguise who they are and where they are. But a lot of secrecy is impossible to achieve. Members of the harbor gang can see what kinds of traps you are using when you bring them ashore, they can observe where your traps are placed in the water, and they can observe how many lobsters you are catching when you bring them to the dealer's dock to sell them.

In all harbor gangs fishermen are expected to obey certain rules. People are expected to obey the conservation laws and avoid molesting the traps of other men. In some parts of the coast, it is customary to use singles or doubles (i.e., one trap on a line or two); in other places it is traditional to use many traps on a single line, called "fishing trawls." In many areas, the number of traps that can be fished on a line has been formalized into law. Everywhere, it is considered poor form to place traps in places where they will become entangled with those of others. Harbor gangs also have local rules. For example, on Monhegan Island one does not leave one's skiff or fishing equipment for long periods on the only beach on the island, where it will impede the activities of other fishermen. In Stonington, fishermen do not leave their boats at the town wharf overnight where they will make it impossible for vessels to use the wharf in emergencies. Some harbor gangs also have informal trap limits.

Fishermen are capable of putting intense pressure on each other to conform to group norms. Young fishermen who inadvertently cause problems by clogging docks with their traps or leaving their skiffs in places that bother other people are usually corrected verbally. Older fishermen who violate local rules repeatedly are treated much more roughly. In some cases they are sanctioned in meetings with other fishermen, in other cases by screaming matches or fist

fighters. In all cases, fishermen who get the reputation of violating serious norms such as molesting the gear of other men or stealing lobsters from their traps or violating the conservation laws will be seriously punished. In some cases, they will be driven from the business.

Lobstermen have little or no contact with other lobster fishermen from other harbor gangs, even when the harbors are only a few miles distant. The lack of contact is, in large measure, the result of a coastal geography with long peninsulas making transportation difficult. Members of different harbor gangs tend to think of each other in terms of stereotypes, which can range from relatively benign to very negative (Acheson 1988:51). These stereotypes reflect not only the lack of interaction, but also a history of competition for lobster bottom. If a particular lobsterman has not had trouble with the men of another gang, he knows someone close who has.

In any harbor gang, there is a prestige hierarchy. A number of factors determine one's standing in the harbor gang. The first, and most important is amount of fishing success and income. Being a "highliner" who catches a lot of lobsters goes a long way to elevating one in the hierarchy. The standing of these men is enhanced by material evidence of success such as a new, well equipped boat, a nice house, or a shiny new pickup truck, etc. Correspondingly, poor fishermen, sometimes called "dubs," tend to be held in low esteem.

But adherence to valued norms of the community also plays a role as well. For this reason, those who have the most prestige are "highliners" from old established families, who have showing a willingness to serve the community, and who have avoided conflict and behavior defined as illegal and immoral. The people with lowest prestige are "dub" fishermen with a history of violating the lobster conservation laws, who have hobbies such as taking "dope" and "swapping girlfriends."

Fishermen can be very competitive with each other. They strive hard to become a

"highliner" and avoid being a dub. Fishing success not only affects one's income, but one's standing in the gang.

Fishermen with high prestige usually are called on to assume leadership roles in the political affairs of the gang. They are elected to political offices in organizations influencing lobster fishing, and they tend to represent the harbor gang in dealings with all kinds of outsiders. They are treated with deference and their opinions are sought by others. These men have had an influence on the politics of the lobster industry far out of proportion to their numbers.

Members of harbor gangs are capable of being very competitive, and as in all small groups, they are capable of putting intense pressure on other members to conform to expectations. These characteristics of gangs play no small role in the politics of harbor gangs.

Corrected by Ann 11/4/00. Bib. checked 11/20/00. Bib corrections 4/24.

Additions: page 14, 29, study zone in preface; 43 (check with robin) 55 Map; 55 game theory; formula in fn 2, p. 63. Reviewers comments added 9/14/01

Chapter 2

Spatial Strategies and Territoriality

The state of Maine is currently home to two very different ocean tenure systems. According to the law of Maine, all of the oceans, lakes, rivers and the animals in them are considered "owned" by all of the people of state. Technically, they are held in trust by the state for all citizens. All beaches to the low water mark are owned by the state, and all citizens have legal access to them. According to the law, anyone with a lobster license is allowed to fish anywhere in the ocean.¹

In the lobster fishery, a different tradition prevails. All along the coast of Maine, lobster fishermen have traditionally divided the coastal waters into areas where only certain groups can fish. A person does not go lobstering at all unless he is accepted by the group fishing from a harbor; and once accepted by a "harbor gang," he is usually restricted to fishing in the territory of that harbor. These groups defend against territorial incursions with threats of violence and, in extreme cases, by surreptitious destruction of lobstering gear.

Harbor gangs are quite small. Many harbors contain as few as six or eight boats, and it is a rare harbor that has as many as fifty. The territories are small as well. The largest are no more than 100 square miles in area, and not all of this area is productive of lobsters. It is rare that a lobsterman will work more than fifteen miles from his home harbor, and most are usually within six or seven miles of their harbor even in winter. This means that a lobster fishermen spends his entire working life crisscrossing one small area of bottom which he fishes with a few other men

who he knows quite well. In this respect the lobster fishery differs radically from the ground-fishery, where boats regularly make trips all over the Gulf of Maine, sometimes traveling more than 1000 miles on a trip, or swordfishing boats that regularly fish between Cape Race, Newfoundland and the Flemish Cap, halfway to Europe.

Territories are the result of long term competition between harbor gangs for fishing area.. These fishing territories and their defense have never been officially recognized or approved of by the state. In the past, among state fishery officials there has been a tacit acceptance of this territorial system. Everyone knows it exists, but it is accepted as long as violence and destruction of property are kept to a minimum. When it does those cutting traps are prosecuted in court, long standing tradition aside. However, activities of the state and its agents has done little to alter this informal system. In this sense the lobster industry operates as an encapsulated political system, a system within a system, in which both public officials and lobster fishers make accommodation to each other (Bailey 1969).

Each harbor where boats are moored normally has its own harbor gang and fishing territory. Usually there are as many territories in a township as there are harbors. The town of Saint George has four separate lobster fishing territories: Wheeler's Bay, Tenant's Harbor, Muscongus, and Port Clyde. A few of the largest harbors in the state have two gangs, for example, Friendship, where one fishes the Georges Island area, and the other fishes more to the westward in Muscongus Bay. Unoccupied islands are usually incorporated into the territory of adjacent mainland harbor gangs, but islands further offshore usually have separate territories designated by the island name.

When talking to people who are not in the harbor gang, fishermen will describe territories in very general terms. They will talk about territories along shore in terms of bays, mouths of

rivers or townships. Offshore they will speak of islands, channels or ridges. Actual territorial boundaries are far more precise, and are demarcated by very small geographical features familiar only to people with an intimate knowledge of the area. Along shore, boundaries are marked by such small features as coves, a tree, houses, a rock formation on an island, etc. Offshore, lines are defined in a number of ways. Some are described in terms of two or more visible landmarks. Others are defined in terms of underwater features such as the edge of a gully. Increasingly, they are marked off with loran, radar, or GPS systems [geographic positioning systems]. For example, when fishing along shore, the fishermen from Pemaquid Harbor can go no further east than Pumpkin Cove on the east shore of Pemaquid Point. The eastern line of Green Island is an imaginary line that runs north and south through a buoy in the middle of the channel. The eastern boundary of Metinic Island is a line running from Two Bush Lighthouse to Home Harbor, a small harbor on Hewett's Island further to the north. Part of the offshore boundary of Tenant's Harbor is defined in terms of the 12780 Loran C line. Seen on a chart, these fishing territories rarely have neat, regular geometric shapes. Usually, they appear to be areas defined in terms of irregular lines of different lengths and shapes intersecting each other at odd angles.

Most territories are contiguous, so that one can go from one part of the territory to another without running across areas fished by other harbor gangs. However, in some parts of the coast, there are winter fishing grounds offshore which are separated from inshore summer fishing grounds by territories fished by other gangs. This appears to be particularly true in lower Penobscot Bay.

Knowledge of territorial boundaries is a highly localized phenomenon in that fishermen know only those boundaries that affect them directly. People from Boothbay Harbor, for example, know the line between their area and Little River, but they do not know much about the

lines between South Bristol and Pemaquid Beach to the east, or between Five Islands and Bay Point to the westward, even though those harbors are within seven miles of Boothbay. In part, this lack of awareness is the result of the geography of the region. Communities are on long peninsulas, making contact by road difficult. In part, it is due to the general reluctance to talk about territoriality.

In general, demarcation of territorial lines varies with distance from shore. Close to shore, boundaries are known to the yard. In summer, when people are fishing close to shore, care is taken to place traps on one's own side of the line. Further offshore, people from several different harbors are normally fishing in the same area. Boundaries are less precise and not defended as vigorously. If one goes offshore far enough, there is no sense of territoriality at all. Fifteen miles from land, one can usually place traps where one wants. In great part, this pattern is connected to the amount of competition for fishing space. In the summer, when lobsters are concentrated close to shore, there is relatively little fishing area and there are a large number of traps in use due to the influx of hundreds of part-time skiff fishermen. "Shedder bottom" [summer fishing in shallow water] is a scarce resource, and people are prone to protect it. In mid winter, when lobsters are best caught in deep water miles from shore, competition for fishing space is not keen. There are far more square miles of offshore fishing ground, full time fishermen are using fewer traps, and the stormy weather has driven fishermen with small boats out of the fishery entirely.

Members of a lobster gang are ordinarily allowed to fish anywhere within the territory controlled by that harbor. There are some notable caveats. A person is expected to avoid tangling gear with the gear of other fishermen. People are expected not to dump their gear on top of gear placed by other fishermen. Those who have placed their gear first in an area are

ordinarily thought to have usufructory rights; others cannot enter the area until someone else leaves. In addition, older, high status fishermen have their favorite spots, which they may have been fishing for years or decades. Many of these are highly productive areas. These older fishermen are likely to place traps in such locations before large numbers of lobster can be caught there. When lobsters do arrive, those who have "camped out" in good spots have monopolized most if not all of the available space. Others, especially younger, less experienced fishermen, are well advised to stay clear of such places. They can lose a good deal by coming into conflict with older, high status fishermen. Some part-timers are quite restricted in where they can place traps. I know two who place traps only in the coves in front of their cottages. They have been told that their traps are safe in those locations, but may be molested if they are placed elsewhere.

Boundary Defense

When a person or a group decides to defend "their" fishing territory against incursion, they will usually warn the violator. Sometimes, the person is threatened verbally or abused in some way, but more usually there is some molestation of his gear. Sometimes two half hitches of rope are tied around the spindles of the offending traps; in other cases, bottles are left in the trap with notes; sometimes the heads in the traps are cut out; in still other cases, the traps are pulled, the legal sized lobsters are taken, out and the doors of the trap are cut off. In other instances, buoys of the offending traps are tied together. In many cases, interlopers will move their traps when pointedly warned in this way. If the violation continues, the defenders may decide not to take further action or they may decide to sanction the interloper further. When they decide further action is warranted, they almost always will destroy the offending traps. This is normally done by pulling the trap, putting the warp line and buoy inside the trap and pushing it over the side. Sometimes the trap is pushed over in deep water where chances of find it are slim. In such

cases, the owner may never be certain what happened to his traps. In other cases, traps are destroyed in ways that advertise the fact that destruction has been purposeful. In some cases, the buoys and warp lines are cut off by the dozens and are found floating all over the bay for days. In other instances, traps are cut in half using a chain saw or wire cutters. When these traps are pulled, there is no mistaking what has happened.

Cutting traps is a very effective way of defending fishing areas. People do not have to resort to more severe sanctions. There is no practical way of protecting traps in the water. Moreover, removing traps not only removes the symbol of someone else's incursion into your territory; it also limits the intruder's ability to reduce the defender's catch, the prime goal.

When trap cutting incidents occur, they are usually kept quiet. Those doing the trap cutting rarely advertise their "skill with the knife" to prevent retaliation by the victim and prosecution by the police. Destroying other people's gear is illegal and can lead to a stiff fine and even a loss of license. Cutting other people's traps is considered somewhat shameful, even though it is considered justified in many cases. In the past, people whose traps were cut did not complain much either. Often they were not sure if their traps were deliberately destroyed or had fallen victim to the weather, or a passing boat. One fishermen said, "when traps are cut all you have is a lot of hearsay." Even when they are certain that the traps had been purposely destroyed, they could only guess who was responsible, and rarely had any evidence. Increasingly, however, victims of trap cutting are going to the police and wardens to seek redress.

There are factors that work to increase friction between men in different harbor gangs and thus stimulate trap cutting, and others that serve to keep conflict in check. Virtually every day someone in a harbor gang has traps missing. Sometimes this is due to the weather or from being cut off by the propellor of a passing boat. In other cases, traps are deliberately destroyed by other

fishermen. Some will cut traps out of frustration with trap tangles caused by people placing traps too close to their own. Competition and past feuds are the root of other incidents.

Much friction between harbor gangs is caused by "pushing the lines," the practice of maintaining their fishing area by using all of their territory or perhaps a little more. "Use it or lose it is the rule in lobster fishing," one man explained. Even after a peripheral area has ceased to be productive, fishermen will leave a few traps there to strengthen their claim to the area.

In most cases, people touch each other's traps only with great reluctance, knowing that their own gear is vulnerable. They are fully aware that a person whose traps have been cut will often retaliate, often against the wrong person. Such trap cutting incidents can quickly escalate into a costly and comic vendetta, with fishermen blindly retaliating against the innocent and guilty alike. As a result, when people defend a fishing area, they use a good deal of care not to provoke a massive or violent response. "The secret of driving a man from your area," one man explained, "is to cutoff just one or two traps at a time." This makes fishing in the area unprofitable, but does not make him mad enough to risk a feud, particularly since he can never be certain who is responsible.

However, once or twice a decade, a full scale "lobster war" will break out somewhere along the coast in which dozens of fishermen will destroy hundreds of traps, and even burn wharfs and sink boats. Such incidents are gleefully reported in the press, with the result that the entire industry has had a unsavory reputation. But such incidents serve as a warning to people in the industry. Thoughtful fishermen realize that no one gains from such "wars," and they would certainly not want to be caught up in one under any circumstances. As a result, they are becoming increasingly rare. As anthropologist Evans-Pritchard (1940) pointed out a generation ago, the threat of a feud can be very effective in maintaining peace.

While this system may seem exotic and unusual in a modern country, riparian rights and ownership of ocean areas is quite common in world wide perspective (Acheson 1981: 280-281). In the Maine lobstering industry, the territorial system has long been a part of the social organization of the industry. Everyone understands the norms concerning where they can fish, and most of the time, they obey them. As a result, there is very little trouble.

The above characteristics pertain to the entire coast of Maine. There are, however, some notable differences in territorial arrangements along the coast.

Nucleated and Perimeter Defended Areas.

In Maine at the present, two different kinds of lobstering territories exist, which I call nucleated and perimeter defended territories (Acheson 1975b, 1988). They differ in the amount of boundary permeability permitted and the ease of entry into harbor gangs.

Most of the harbors in the state exhibit nucleated territoriality, including virtually all of the harbors on the mainland. In these territories, the sense of ownership is very strong close to the mouth of the home harbor where the boats are anchored, but grows progressively weaker the further from the harbor one goes. Intruders placing their traps close to the harbor mouth will quickly lose them. Several miles from shore, the sense of territoriality is weak and a good deal of "mixed fishing" takes place. Entry into these harbor gangs is relatively easy.

Perimeter defended areas are found off a few islands and a few mainland areas, especially in Penobscot Bay. Here the territory is defined in terms of the peripheral boundaries, which are known to the yard and defended vigorously. In these areas, the sense of ownership remains strong out to the perimeter of the territories. Little or no mixed fishing is permitted. Entry into the harbor gangs controlling these perimeter defended territories is much more difficult.

Nucleated areas have far larger territories, and the gangs controlling these areas have

more fishermen than those in perimeter defended areas. For example, there are 30 full time boats fishing from New Harbor; 60 from Boothbay; and 45 from Tenant's Harbor. Friendship and Stonington, two of the largest ports in the state, have over 200 boats in each. By way of contrast, the perimeter defended area of Monhegan Island has twelve lobster boats, Green Island has eight, and Criehaven has eleven.

There are also important differences in the social organization of the gangs having these two different types of territoriality. People in perimeter defended areas have a good deal of interaction and know each other very well. These are primary groups in which everyone has a number of ties with the other fishermen and their families. On the permanently occupied islands, there is a strong sense of community. In nucleated areas there is far less interaction. Many fishermen may know only a few other fishermen well, and have little to do with most of the members of the gang. In time of need, many members have only a few people they can call on for help. As we shall see, these differences have important implications for changes in territoriality and territorial defense.

Nucleated Area

Entry into Gangs

Since the entire coast is fished by the men from one harbor gang or another, a person has to gain entrance to such a group before he can go fishing at all.

Anyone seeking to go lobstering in nucleated territories will experience some hostility from those already established in the business. Most fishermen will have some of their gear molested for a few months after they start, but in some cases the harassment can continue for one or two years. A couple of established fishermen laughingly said that this amounts to a kind of initiation. Newcomers rarely think this is funny, especially since their position is apt to be very

precarious since they are apt to have few traps and a lot of debt, and are unskilled at catching lobsters. More than a few have become discouraged and have been driven out of business by people from the gang they are seeking to enter. After a time, most newcomers are accepted into the gang and the harassment gradually stops. Some people never are really accepted and remain marginal for years.

The hostility to newcomers is understandable. More fishermen in a harbor gang means more competition and fewer lobsters for those established in the business. One Sebasco fisherman said, "Like any business, no one likes to see competition." Moreover, novice fishermen do not know local practices, are bound to make mistakes, get their gear tangled with those of others, and may even need to be rescued on occasion.

The amount of harassment a person experiences depends greatly on personal characteristics. A person will experience less resistance if he comes from the local community, is a member of an old established family with a long history of involvement in the fishery, and has other older relatives in the harbor gang. Such a person almost inherits a position in the harbor gang. His entry into the gang will be made easier if he begins fishing as a youngster in a skiff in the summer and then becomes a full-time fisherman after high school or college.

A person will have the most difficulty entering a harbor gang if he moves into the area from out of state, if his family has no connection to fishing, and he begins fishing in middle age. He will almost certainly be treated very roughly if he begins fishing a large gang of traps, and has another source of income. Such a person is regarded as an "outsider" with no rights to the local resources. He also is viewed as a "hog," taking more than his share at the expense of people who have no other way of earning an income. More important, he has no allies. One man from New Jersey began fishing in his fifties. He not only had a retirement income, a large boat and a large

number of traps, but also had a lot of unwanted advice for other fishermen. He lasted about two weeks in the lobster industry and ultimately left town. His New Jersey roots aside, he might have made out much better if he had spent a year or two as sternman on someone else's boat, and begin fishing with only a small gang of traps.

Local people often voice the sentiment that resources, including land, jobs and fishing area, should be reserved for people from old established families from the local community. According to this ideology, only people from local families should have a right to go lobster fishing. But ideology aside, lobster fishing is not a closed occupation. Plenty of people have entered the industry who are not from lobster fishing families, and a lot of people "from away" have succeeded in becoming lobster fishermen. To be sure, membership in a local fishing family helps ease one's way into a harbor gang, but membership in such a family will not automatically ensure success.

Age at time of entry is a critically important variable. In one harbor studied intensively, all of the fishermen who started fishing as teenagers endured little harassment, regardless of family background. Some were from old established families and had kinsmen in the harbor gang; others were from newcomer families and had grown up in town, and a few were even children of "people from away" who had long spent the summer months in the area.

Perhaps the single most important factor influencing entry into a harbor gang is willingness to abide by local norms and the conservation laws. A person who molests other people's gear, takes lobsters from their traps, or sells short lobsters will not last long in the industry, regardless of family ties or age.

In most cases, part time fishermen will have a more difficult time in gaining acceptance than full time fishermen despite the fact that full-time fishermen use more traps and take more

lobsters. The hostility directed at part-timers stems in great part from the fact that they are seen to be competing unfairly. They already have one job, usually one giving good benefits, and yet are taking lobsters from someone who has no other source of income. In addition, they are not as dependent on the industry, with the result that many have a more cavalier attitude towards local norms and practices. Many make up for their lack of skill by dumping traps on those of skilled fishermen or pulling their traps to find out which ones are fishing well. Even worse, they can't be sanctioned as easily, since they have little to lose. In the words of one man, "The most dangerous man around is a part-timer with a skiff and fifty traps. He can destroy every trap you own overnight. If you cut off all his traps, he still hasn't lost anything and he has another job to boot."

No single factor will ensure easy entry into the fishery. The characteristics affecting entry into the industry are additive, and a positive trait can be counter balanced by a negative characteristic. This means that it is sometimes very difficult to predict how people will be treated. One friend was treated particularly badly when he attempted to enter the lobster fishery in the community where he spent his childhood and where his relatives had lived since the middle 1700's. He left town with his parents when he was eight years old, and when he returned at age thirty-three, he tried to go lobstering, only to have his traps repeatedly destroyed by people who came from families that had been in town only half as long as his own. He believes that he would have been accepted much easier if a close relative (e.g., father, brother) had been fishing from the harbor when he tried to enter lobstering. This may be true. But his case suggests that other variables were more important than kin ties. Age at time of entry probably played a key role, since he did not have the experience of fishing as a "youngster" and had few friends in his age cohort. His job as deputy sheriff made him very suspect among some people, and the extra

income his part-time job gave him alienated others.

In the future, there will be no complete newcomers trying to enter the fishery. The new apprenticeship program, which went to effect in 1995, mandates that one can only get a class A license by first having a student license and fishing in the summers as a teenager or by working for 200 days on someone else's boat. This means that people entering the fishery will have had some experience and will have had time to make friends. It is now impossible for a newcomer to show up on the dock one morning and try to go lobster fishing the next day. This should ease entry into the fishery.

Over the course of the past half century, it has already become easier to enter harbor gangs of nucleated areas. In the years before and after World War II, people from out of town were not permitted to join a harbor gang, and men from non-fishing families were harassed more. In some harbors people with another job had little chance of succeeding in lobstering. It was not at all uncommon, according to older informants, for people to be told that they were not welcome, either in verbal confrontations, by letters, or by obvious and hateful harassment, such as having garbage dumped in their boat. Even hiring people from others community as lobstermen was frowned upon, out of fear that such people might find their way into the harbor gang eventually. One older man from Cushing recalls that when he hired a sternman from an island community, he was invited to a big meeting of fishermen from his home harbor and pointedly asked to fire the man. He did not do so, and he was ostracized by several people for months.

Even prior to the passage of recent legislation, adults from out of the local area with no family in fishing could become members of a harbor gang by using the right strategy. Their acceptance is virtually assured if they make friends in the community, take care not to violate the

local norms, and begin fishing by in a way that does not greatly affect the amount of lobsters available for others (i.e., begin as a sternman or fish a small gang of traps from a skiff.) As a result, virtually every harbor has several lobster fishermen who live in other towns. As a result, virtually every harbor has several lobster fishermen who live in other towns. The license list contains the names of many people from inland communities. *Do license list study. In zone a 184 of 799 men came from inland towns.*

Even people from out of state have succeeded in entering lobstering. One such person who came originally from Massachusetts moved into a Penobscot Bay town, and began driving the local school bus. After a few years, he bought a skiff and a few traps and began lobster fishing. A few years later, he purchased a big boat and a full gang of traps, and drove the bus on a part-time basis. Another fisherman said. "I knew the second he bought a few traps that we were going to have another lobsterman eventually, and that he didn't plan to stay driving the bus any longer than necessary. I should have driven him out of business before he got established. After he had been fishing for several years, he got to be part of the town and there just didn't seem to be anything you could rightly do about it."

As a result of a relaxation of the barriers to entry in nucleated areas, the number of active fishermen in every harbor has grown. For example, David Cousins, President of the Maine Lobsterman's Association reports that when he began fishing 30 years ago, "There were six people fishing in the South Thomaston inshore area [summer fishing grounds;] now there are almost 60. Many, don't even live in town. Nothing happens to them." One hears the same thing from towns all up and down the coast *In X there were fishermen in 1960 and active fishermen now.*

Territorial Defense in Nucleated Areas

In nucleated areas, incursions into the area normally fished by another gang meets with no automatic response. Sometimes traps are placed in areas which are considered to belong to another gang, and the intruders get away with the incursion for a long time. In other cases, intruders are sanctioned quickly. Two factors strongly influence how intrusion is treated. The first concerns how many traps are being placed and where they are placed. People can sometimes place a few traps in fishing locations at the outer limit of a territory and have little difficulty for months. People might grouse, and the intruder's traps might be treated a little roughly or disappear when they become entangled with those of men who consider the territory their own, but no attempt will be made to repel this person. On the other hand, placing a large number of traps deep in the territory of another gang, close to their anchorage, will almost certainly provoke a reaction.

The second factor is the personal characteristics of the individual. People with a lot of potential allies can get away with incursions better than those who are not in position to get support from many other people. For this reason, older respected fishermen from large, well-established families can get away with incursions better than younger fishermen, unpopular men or newcomers. No one wants to court trouble with a respected leader of a harbor gang who can bring to his aid six or eight friends. Such a person is also very apt to be able to turn the tables on the defenders and be able to brand the defenders as unsavory criminals and trouble makers. Another factor that allows people to fish a wider territory is family and friendship ties (history of belonging in an area. One person from Portland fishes very close to Long Island, in an area most islanders see as theirs exclusively. He explained, "They [the Long Islanders] are not going to bother me. My wife came from Long Island and my brothers in law fish on Long Island. We are on good terms."

Last, people who have changed harbor gangs are often still allowed to fish in the area of their original harbor gang. One older fisherman whose family used to live on an island near Ocean Point, whose waters are fished by Little River fishermen, moved to Pemaquid Harbor. He is known as a Pemaquid Harbor fisherman and he fishes the Pemaquid Harbor area, but also has continued to fish in the area used by the Little River and the South Bristol area in between. Another man who used to fish out of Pemaquid Harbor moved his boat to South Bristol and began to sell his lobsters in South Bristol. Although most people now consider him a South Bristol fisherman, he continues to fish in area which Pemaquid Harbor fishermen consider their exclusive area. To date, he has not been bothered.

The case of two cousins fishing from New Harbor is very instructive. These two men were fishing in the same area just north of Thief Island and Jones' Garden in Muscongus Bay in the summer of 1998. One fished there with impunity. The other lost 150 traps in one night. These traps were stacked on an island and burned [the vinyl covering on these traps apparently burns well when ignited by gasoline]. Men from Bremen, Friendship and Waldoboro are variously suspected of this crime, but no one has been arrested.

To be sure, the area around Jones' Garden has recently been a contested one. The waters around this island had been fished primarily by men from Bremen and Friendship. New Harbor and Round Pond fishermen began frequenting this area only in the early 1990's. It is likely that some of the fishermen who consider themselves "traditional owners" were looking for an excuse to teach one of the upstarts a lesson. But why was one cousin's traps selected for destruction while the other's were left alone? I asked one knowledgeable man this question. He said "Richard [unmolested man] has been fishing in that part of the bay since he was a kid. His father used to come up here when Richard was his helper. He is a very good fisherman. David

[molested man] just began fishing; his father is a doctor who helped him get a big boat and a lot of traps; he grew up in Massachusetts; and he is a loudmouth." In short, despite the fact they are cousins, one is local and a highly respected fisherman with a lot of support; the other is a newcomer and a "dub" with few allies. One is a far more dangerous adversary than the other.

In much of the area fished by people from nucleated areas, mixed fishing is allowed. But "mixed fishing" does not mean open access. There are restrictions on where people from one harbor can go. They cannot go in the areas around the harbor mouths of other harbor gangs. This is area that is normally fished exclusively by other harbor gangs. For example, the people from South Bristol share a lot of area in John's Bay with the fishermen from Pemaquid Harbor, but the South Bristol men cannot go beyond Beaver Island about one half mile from the anchorage in the Pemaquid River, and the Pemaquid Harbor fishermen cannot fish in the "Gut," the narrow body of water where the South Bristol fishermen anchor and which is their exclusive area. The fishermen from New Harbor, Friendship, Round Pond and Bremen fish together in much of Muscongus Bay. But no New Harbor fisherman can fish north of the an imaginary line running from the southern tip of Cow Island to the southern tip of Friendship Long Island without losing traps to Friendship fishermen. And they can't go north of Coombs Ledge, the southern tip of Hog Island, without running into trouble with the Bremen fishermen. Most New Harbor fishermen would not fish this far north. By the same token, the area right outside the mouth of New Harbor [from Chamberlain to Pumpkin Cove] is reserved exclusively for New Harbor fishermen.

Moreover, the area that is fished by people from several harbor (i.e., a mixed fishing area) is not open to anyone from any harbor. For example, the area around the Western Egg Rock in Muscongus Bay is fished by people from New Harbor, Round Pond, Bremen, and Friendship.

But fishermen from Cushing or Boothbay would certainly court trouble if they fished there.

Most people from nucleated areas when asked about their fishing area have little difficulty in drawing the peripheries of their fishing ground. They are fully aware of how they and others in their harbor can go before they begin to lose traps. Other fishermen have more difficulty in describing their fishing areas. The internal variation causes problems. They know how far they can go personally before they lose traps, but they know others can range further or shorter distances, and they often are not aware of the outer limits where all people from their harbors have traps. Moreover, fishermen do not place traps uniformly; they place them in areas where lobster are concentrated. When they are fishing offshore in the winter, large amount of areas have not traps at all; the traps are placed in "sweet spots" or as close to such spots one can get without undue risk of entanglements. Most important, these fishermen know that mixed fishing is allowed in a large portion of the area in which they fish. For these reasons, defining fishing areas in terms of a single continuous line around the periphery of the area they fish does not get at the reality of the situation in their minds.

Perimeter Defended Areas

The social organization of the gangs fishing most perimeter defended areas is very different from that of the nucleated areas. These gangs are operating under conditions that have made it possible to develop rules and practices concerning fishing that confer joint benefits on the gang as a whole. The rules concerning territory are different; they have developed strict rules limiting entry to their harbor gangs; they are better able to defend their fishing territory; and some have developed informal trap limits. In this chapter, I will describe the territorial rules and the defense of those territories. The next chapter will cover the complicated circumstances allowing these gangs to develop rules for mutual benefit.

Perimeter defended areas, as the name suggests, are defined in terms of the peripheral boundary surrounding the area. In these territories, there is a very strong sense of ownership of all of the waters in the territory area that extends up to the boundary. The boundaries are known to the yard, and are very strongly defended. These areas are fished exclusively by the people from the harbor gang owning the island, and perhaps a few others who are permitted to fish there.

Most perimeter defended areas are islands in the Penobscot Bay area, but a few mainland harbors in that same area have many of the same characteristics. Interlopers placing traps within the borders of the area of Monhegan, Criehaven or Green Island are almost certain to lose traps very quickly to the harbor gangs owning these areas, who traditionally have shown little tolerance for those who violate their boundaries. In these areas, little mixed fishing is the rule.

Part of the defense strategy of these islanders is to make sure that their territory is utilized out to the borders so there is not a lot of space for additional traps. Unused bottom is an open invitation for others to move in. If others move into your area, it is advisable to deal with the situation immediately. One person explains "Once you have lost bottom for a year or two it is hell to get it back. It is the young guys who cannot remember who are the problem. They say 'but we fished these the past two years.' They can't remember you have been there for the past fifty. Old guys will not defend it against them and so it goes [i.e., is lost to another gang]."

Some, but not all, of the fishermen defending perimeter defended areas show little remorse about cutting traps of interlopers. One said: "When you go over the line, they put two half hitches on the spindle of the buoy. This mans take them out of there. If you do not want to lose your traps, move them. If you do not move your traps, it is your own fault."

There is a feeling among all concerned that if the people "owning" perimeter defended areas are not going to permit any fishing in their area, they should not expect a share of the

fishing area outside of it. Still, there are a number of cases where gangs from perimeter defended areas insist on maintaining exclusive fishing rights to the area within their boundaries and still fish in deep water, outside the boundary, in the winter. Woody Post, a Metinic Island fisherman, admitted to fishing further to the south of the Metinic line even though they have made no claim to the territory. He said, "We have taken the area over, and they have not pushed us back." He admits they would probably abandon this area if anyone pushed them.

The people fishing perimeter defended areas defend their exclusive ownership practices in a number of ways. These fishing areas have existed for a long time, so that everyone in the area recognizes that these island owners have more than usufruct rights to the water around the island. Moreover, there is a tradition that people who own the land have a right to the "short warp" fishing near shore. Since virtually all of these fishermen own land or houses on the island, they have, in their view, rights to the waters near the island. One island fisherman voiced this sentiment well when he said, "my family has owned this island since before Maine became a state, and the state isn't going to take these waters away from us." In short, in the local culture, generations of use combined with land ownership conveys fishing rights. Cultures, as all anthropologists know, is very persistent. As a result, people will buy islands, in great part, to get the fishing rights ownership confers. One person I know, who lives in the Rockland area, bought a small island in the Muscle Ridge channel in the 1970's. "I can go fishing off the island in the summer, and it is a good investment," he said.

In nucleated areas, fishermen who move away and no longer fish will lose their membership rights in the gang after a period of years. This is not true of the perimeter defended areas. One is an owner of the island after all, and no one can take away the right to fish this confers.

Entry into Gangs Fishing Perimeter Defended Areas

It is vastly more difficult to gain entrance to the harbor gangs exploiting perimeter defended areas. This is to be expected, given the fact that the objectives of territorial defense and barriers to entry are linked. The objective of maintaining strict boundaries around an ocean area is to keep the number of fishermen low to decrease competition. There is no sense incurring the costs of defending such a territory against incursions of other harbor gangs if anyone can join your own.

Every perimeter defended territory has developed a set of rules restricting membership in the gang. They are highly restrictive and make it impossible for most people to enter the gang. The rules governing entrance to these gangs vary considerably from one perimeter defended area to another. On islands such as Swans Island, Vinalhaven, Matinicus and Islesboro, fishing rights are reserved for island residents. Most are from established families with a history of fishing, and own land on the island. To go fishing off Criehaven, one must purchase one of eleven "berths," which are very expensive, from the prior owner. On Monhegan, permanent residence is not enough; one must complete a special two year apprenticeship program, and be permitted to buy one of the 12 moorings. (Until recently, entry to the Monhegan gang was controlled by informal rules; recently these rules have been passed into law.) The waters off several unoccupied islands in Penobscot Bay such as Green Island, Metinic, and several smaller unoccupied islands in the Muscle Ridge Channel, are reserved for the owners of the island or a few people to whom they "rent" fishing space.

Territorial Defense

Several factors have aided the men fishing island territories in maintaining their exclusive areas. One is the costs of transportation: it costs extra gas and time to get to and from island

areas. But cost of transportation is not a major factor. In this regard, it should be noted that some of the perimeter defended areas are currently unoccupied, and the men exploiting these waters find it worthwhile to travel back and forth every few days or even every day. Distance does not deter them, even though it adds to their costs of doing business.

The second is ability to organize an effective defense. While there is some variation in the social organization of these islands, a number of factors make the defense of their island territories especially effective. First, islands are able to muster a large number of people to defend their territory. While the number of people on the island may be small, the number of people they can muster on the line may be far larger than those wishing to invade their area. The islanders are often well led, and they have a long term strategy that everyone in the team supports. In many cases the leaders are older men, who use their role as family elder to coordinate the activities of younger kinsmen and other allies. Obedience to elders is still strongly valued in rural Maine. In other instances, the island's defense is coordinated by a group of older men, usually respected highliners, who can persuade or bully others into doing what they want. In some cases, the influence is buttressed by legal ownership of family property, or control over valuable community services. Second, these gangs are small, and it is easy to monitor the activities of gang members. One knows who the shirkers are. In these groups, it is not wise to get the reputation of not doing one's share to defend the most valuable resource the island has~its lobster fishing territory.

Third, dependence on the lobster fishery motivates coordinated action. On most of the occupied islands, lobster fishing is the major source of employment; and on some such as Frenchboro, it is the only way to make a living. In a situation in which maintaining fishing

boundaries is seen as essential to the continuance of the community and all of the fishing families in it, failure to contribute to boundary defense is not taken kindly.

In some cases, there is a strong feeling of community, which affects the ability of people in such communities to coordinate activities. This will be discussed in great detail in the next chapter.

All of these factors make it very difficult for people on some of these island to free ride on the efforts of others. One person said, one time a person who had been doing more than his share to maintain the territorial boundaries came to him and said. "I am tired to doing the dirty work. I want some help or I am all done. One or two of us came to the rescue. If that hadn't been enough, we would have got one or two more. We keep coming together [in a coalition] until you get what you need to do the job [i.e. drive off intruders]." They have been most successful.

Nucleated and Perimeter Defended Areas: A Comparison

Nucleated and perimeter defended areas differ in several important respects. In perimeter defended areas, the sense of ownership of fishing area is far stronger and more permanent. On most of these islands, membership in an island family and inheritance of island land confers rights to fish in the island's lobstering area in the eyes of those in the local culture, if not in the eyes of the law. Even if a member of a perimeter defended area is not currently fishing, his rights to fish remain. He owns land after all. Islanders worry that in selling land to "summer people," they and their kinsmen will lose fishing rights, which they regard as an insurance policy of sorts. Interestingly enough, if land is sold to an outsider the new owner may be permitted to go lobster fishing, but this is not always the case. Lobstering rights are not automatically

transferred in a deed.

Fishing rights in nucleated areas are usufructory to a large extent. If a person moves away and stops fishing, his claim to fishing rights becomes progressively weaker. His children will have a more difficult time entering lobster fishing than if he were an active member of the harbor gang. If he stays away from town more than a few years, he might have a difficult time rejoining the harbor gang.

Those fishing perimeter defended areas have a strong historical sense. In their view they are carrying on the traditions of their grandparents and even great grandparents. In their view, their rights to their fishing ground is buttressed by the fact that islands have been "in the family for a long time," and that the rules that guide their behavior have existed for a long time. As in many communities, longevity gives sanctity to norms. Such beliefs serve as an ideology to buttress current practices and strategies.

In towns with nucleated areas, coming from an old established family is important and is said to confer rights to fishing area and other resources. But the ideology here is weaker. Membership in an old established family can be manipulated to confer benefits, but it often seems to count for little. In great part, this weakening of local ideology is due to the fact that such mainland towns are much larger and can contain thousands of "summer people" and "people from away" who have different values and interests. Moreover, the territorial rules in many mainland communities have changed , sometimes dramatically, over the past few decades and are still in the process of changing. People in these communities are less likely to look to the practices of the past for guidance. Their world is different from the world of their grandparents, and they know it.

Last, people in perimeter defended areas catch more lobsters per unit of effort than people in nucleated areas and those lobsters are larger. In addition, there are a higher number of egged lobsters in perimeter defended areas. The data to buttress these statements were gathered during a study in 1973-74 of traps owned by 28 fishermen from three nucleated harbors (Port Clyde, New Harbor, and Friendship) and three perimeter defended harbors (Green Island, Metinic, Monhegan). These harbors are all along the central Maine coast and all are within 20 miles of each other. In every season of the year, the pounds of lobster caught per traps and the size of those lobster is larger in perimeter defended areas than in nucleated areas (see Table 2.1) (see Acheson 1975b; 1988:152-158).

Table 2.1
Catch Characteristics by Area and Season^a

	Season 1: August 1 to December 31		Season 2: January 1 to April 30		Season 3: May 1 to July 31	
	Nucleated	Perimeter defended	Nucleated	Perimeter- defended	Nucleated	Perimeter defended
No. lobsters caught	366	767	710	2268	2093	2779
No. lobsters caught per trap	.62	1.29	.47	.95	.70	1.07
Mean pounds of lobster caught per trap hauled	.73	1.64	.565	1.21	.9111	1.29
Pounds/lobster	1.16	1.25	1.18	1.32	1.20	1.24

^aSource: Acheson 1988: 155

In addition, the stock density of lobsters is higher in perimeter defended areas than

nucleated areas. The standard method of establishing stock density in the lobster fishery is to measure the pounds of lobster caught per trap per lay over day. As can be seen from Table 2.2, the stock densities in all seasons are higher in the perimeter defended areas.

Table 2.2
 Square Miles per Boat in Nucleated and Perimeter Defended Areas^a

	Harbor	Number of boats	Total area in square nautical miles	Square nautical miles/boat ^b
Nucleated areas	Port Clyde	39	30.4	.8
	New Harbor	36	44.7	1.2
	Friendship	95	25.3	.3
Perimeter defended areas	Green Island	8	11.0	1.4
	Metinic (s. end only)	7	10.8	1.5
	Monhegan	12	20.0	1.7

^a Only the boats of full-time fishermen have been counted. *Source:* Acheson 1988: 154.

^b In reality, the amount of fishing area available to men from nucleated as opposed to perimeter-defended areas is far smaller than these figures would indicate because much of the area fished by men from nucleated harbors consists zones of mixed fishing.

These figures indicate that perimeter defended territoriality is associated with favorable biological and economic effects. The larger size of the lobsters caught in perimeter defended areas indicates that the breeding stock is in better condition there. More have survived here to the sizes where they can extrude eggs. After all, a higher percentage of large lobsters are capable of extruding eggs than small lobsters, and the number of eggs produced increases exponentially with size. This conclusion is further substantiated by the fact that 2.7 percent of the lobsters caught in perimeter defended areas were egg bearing females as opposed to only 1.2 percent in

the nucleated areas.

Moreover the figures on pounds per trap per lay over day indicate that there is a high number of lobsters inhabiting a given area of bottom [stock density] in perimeter defended areas than in nucleated areas.² There will be more there to catch in the future, and a larger number to survive to reproductive size. All of this indicates that perimeter defended territoriality will produce more eggs per unit of bottom area and more lobsters, with all this indicates for the future of the fishery, catches and the vitality of the breeding stock.

These differences in productivity have economic implications. The larger number of pounds of lobster produced per trap means that the average trap hauled in a perimeter defended area produces more revenue for its owner than one pulled in a nucleated area. It also means that people fishing perimeter defended areas get a larger number of big lobsters, which bring a higher price per pound, since they can be sold as "dinner lobsters" to upscale seafood restaurants.

What produces the favorable biological and economic effect in perimeter defended areas? Without doubt, a crucial factor is the fact that there are fewer fishermen in perimeter defended areas, and they have more space per fisherman. As can be seen in Table 2.2, the size of the perimeter defended areas is smaller than those of nucleated areas, but the number of square miles per boat is much higher. In addition, several of the perimeter defended areas, including all of those in the sample, have self imposed trap limits (discussed in the next chapter). Since each fisherman in perimeter defended areas has more productive bottom and the same number or fewer traps than people in nucleated areas, it is not surprising that the average number of pounds per trap is higher than it is in mainland harbors where trap congestion is a serious problem.

The small number of fishermen in perimeter defended areas is due to the fact that

perimeter defended areas have various kinds of barriers to entry into their harbor gangs. Limited entry has favorable economic results.

The favorable biological conditions observed in perimeter defended areas is more difficult to explain. One factor is the reduced fishing pressure on the lobsters stemming from two kinds of institutions employed by fishermen in perimeter defended areas: control on entry and the number of fishermen and trap limits. Since there are fewer people and fewer traps per square mile, there is less exploitive pressure on the lobsters. More lobsters survive, lobsters are older and thus larger when they are caught, and more survive to the size where they can extrude eggs.

Another factor which almost certainly plays a role in producing the favorable biological effects observed in perimeter defended areas is the tendency for more large lobsters to migrate to deep water than smaller lobsters. This differential migration almost certainly helps to explain the larger number of big lobsters in perimeter defended areas which have more deep waters, as well as the larger number of egged lobsters. However, there is no reason to think that migration affects the stock size. The larger stock sizes observed in perimeter defended areas are almost certainly due to lower fishing pressure.

Last, but perhaps most important, the people in perimeter defended areas have been able to solve two communal action dilemmas, which the people fishing nucleated territories have been unable to handle. They have been able to generate rules and practices that limit entry to their harbor gangs. They have also been able to organize the defense of their territory. In both cases, the incentives to be "free riders" are strong. As we shall see in the next chapter, a complicated number of factors lies behind the ability of these island communities to overcome these

communal action dilemmas.

The Politics of Boundary Movement

The course of the past 100 years all fishing boundaries have moved, some far more than others. In Penobscot Bay, there has been relatively little movement. David Cousins, President of the Maine Lobstermen's Association, who fishes from South Thomaston said "none of these lines have changed appreciably in the past 80 years." In the western part of the study zone, there has been substantial boundary movement, and it has occurred rapidly.

Technological changes opened the possibility for boundary changes. As rowing dories and sailing vessels were replaced by larger boats with gasoline powered engines, the distance people could travel increased, along with the number of months they could fish. The powered trap haulers (1930's and 1940's) made it possible to fish more traps over a far wider area, while depth finders coming on the scene in the 1950's made it possible to learn the bottom. Radio gave people advanced warning of storms. By the middle of the twentieth century, it was possible for large numbers of fishermen to efficiently exploit waters miles from their home harbor during the winter months in reasonable safety. While the new technology increased the area a person can fish, this does not explain why people are allowed to fish large areas on the mainland, and are more restrained in the more eastern areas around Penobscot Bay. The technology is the same along the entire coast.

The differential breakdown of boundaries is a side effect of the competition of groups of fishermen for fishing space, which results in changes in territorial lines. A change in boundaries occurs when individuals or a group, usually from one harbor, successfully invade a place that had been fished by people from another. Boundary changes occur at varying rates of speed, and

involve different amounts of violence

At times very rapid boundary movement can take place without violence. This has occurred in several instances when island residents moved to the mainland, and have decided not to defend island areas. In those cases, the traditional island areas are incorporated into the areas of nearby mainland towns. In the 1950's the Loud Island area was incorporated into the Round Pond area; and Teels Island was sold to an outsider and its traditional fishing ground was appropriated by men from Port Clyde and Cushing.

In other instances, boundaries move as a result of slow, long term incursions of a group of fishermen into the area held by another. Until the 1980's, fishermen from Back Narrows on the upper Damariscotta River defended an area in the upper river which they fished exclusively. Fishermen from South Bristol did not fish above Fort Island. In the 1990's the Back Narrows fishermen began to fish further down the Damariscotta River in areas which had been fished only by men from South Bristol and Little River, and the South Bristol fishermen began to place traps far up the river. This was accomplished with virtually no trap molestation by either side. In the summer of 2000, it was reported that two men from South Bristol were placing traps all the way to the town of Damariscotta, some 12 miles north of South Bristol. This means that all boundaries have disappeared in the Damariscotta River, at least temporarily.

In some cases, invasions of territories meets with very stiff resistance and a good deal of violence ensues. In the 1950's six men from Tenant's Harbor decided to fish in the area of one of the perimeter defended islands in Penobscot Bay. They deliberately set traps over the boundary line. When their traps were cut off, they retaliated in kind. After several forays in which dozens of traps were lost (duly reported in the press) the islanders retreated a few hundred yards and a

new boundary was established.

Not all attempts to increase fishing areas succeed. For decades, there have been repeated forays against the Green Island boundary. To date, the men fishing Green Island waters have been able to repel every invasion, sometimes at considerable cost, maintaining their boundary intact.

Boundary movements are rarely the result of actions taken by individuals acting completely alone. To be sure, individuals get into small fracasés all the time. Some people seem to have a penchant for trouble, and continually crowd other men and push boundaries. It is a rare day when at least one fisherman in a harbor gang does not suspect that some of his traps have been molested in some way. Sometimes they retaliate. But such small scale disputes are apt to result in stalemates with little effect on boundaries. More important, any individual who gets into conflict with a coordinated team is almost certain to be the loser. Boundary movement, when it occurs, is almost always the result of actions by groups of individuals. One group of fishermen will move into the area fished by another, and that other group is not successful in defending its fishing area, or decides not to defend it.

There are two factors which influence the success of such groups: the organization and effectiveness of the groups for coordinating action and their relative willingness to accept losses to gain extra territory (rule of thumb cost benefit analysis.). I will call these groups of fishermen who are competing for territory "political teams" after F.G. Bailey (1969).

Political teams of lobster fishermen are apt to be fairly small. Most involve three to eight fishermen; only very rarely can 15 or 20 men coordinate their actions for long. There is a strong tendency for such teams to be composed of young fishermen who are as much interested in

raising hell and excitement as the more serious side of political conflict at sea. Older men might instigate fights, but they rarely are in the thick of them. There is, however, major differences in organization and duration of these groups. In many harbors, when political teams are formed at all, they tend to be groups of friends or acquaintances from one harbor gang who get together to engage in one or two forays with short run goals in mind, (i.e., driving one person from their area.). If such groups have a leader, he is apt to have no resources that give him the ability to reward or sanction his followers. It is not at all uncommon for groups to agree on a course of action, only to discover that many people have defected, leaving one or two to make the threats and cut the traps. In some cases, people find out they have been abandoned by their team mates before any illegal activities take place. But there are cases when people have cut traps, in the firm belief that other people were going to follow suit, only to find that they and perhaps one or two other "suckers" have done the dirty work, and that all the blame is theirs. In other cases, one person's traps will be attacked and others will make vicious noises, but will not take any action that endangers them.

In other cases, fishermen are able to form much more cohesive teams to advance their political interests. These groups are able to coordinate their activities over the long run. They aid each other in forays. They are able accomplish feats in a few hours on one night that would be impossible for a single person. They can aim a coordinated attack against one "enemy" fisherman with devastating results for that person. Participants maintain a blanket of silence about the activities of the group, spread favorable rumors, and some have even gone so far as to provide alibis for each other. They can pool information about the activities of their enemies and help to guard each other's gear. A person who takes on one member of such a group will find

that he must deal with several enemies. Members of such groups are able to spread the risks and costs of boundary defense among their membership. If you are one of two people cutting traps to hold a line, you are very vulnerable, and all retaliatory efforts will be aimed at you. If you are one of ten people, the blame and losses are shared. As one person from a perimeter defended area explained the situation, "You need more than one person doing it [defending the lines]. Otherwise one person is a scapegoat and takes a beating" Perhaps most important, such "teams" provide friendship and support in a time of stress. One man said that after he and several other islanders (i.e. team members) had lost a lot of gear, they held a meeting at the house of one fisherman. "It started out with a lot of ugly talk, but we were able to pretty well figure out who did it [retaliatory trap cutting]. By the end of the evening we were even having a little fun. Some people can turn anything into a joke. I guess it is a good thing."

As we have seen, the effectiveness of the defense of perimeter defended areas is bolstered by a number of factors, including the small size of the gangs, effective leadership, the dependence of island families on each other, and the close knit "community." The defense is further buttressed by the fact that these islanders are very dependent on the lobster resource. In short, they are able to mount an effective defense and have a strong motivation to do so. Thus the perimeter defended areas remain.

This is not to suggest that the only effective coordinated teams are found on islands. There well coordinated teams that have successfully held fishing territories in the upper reaches of three rivers. They, too, are composed of kin, and are very dependent on the area for their livelihood since they have small boats and cannot fish outside the estuary (*Creamers and Coffins*).

The second factor affecting boundary movement is the value of the fishery to a team and the willingness to incur losses to maintain hold of it. Some fishing grounds, acre per acre, are more productive than others. Some are far more crowded. The rewards are far higher to the individual to remove a competitor from an overcrowded, highly productive ground because this will increase one's own catches. The rewards are far less for removing a competitor from an unproductive ground with few people fishing it. Here, removal of competitors will not increase the productivity of one's own traps by very much. Rewards are also strongly influenced by the number of months one can fish, and this in turn depends on the variety of areas held. If one has access to several types of fishing bottom at varying depths, one can fish throughout the year. Gaining access to a piece of bottom that permits one to fish more months a year is especially valuable. Another factor that influences the decision to gain or keep access to a particular piece of bottom is the cost of conflict. A fisherman is not likely to lose many traps if he is part of a group who can help monitor each other's traps, who place traps in an area of low value to another gang. On the other hand, losses will be appreciably higher if one person alone place traps in an area that is of high value to members of the opposing gang.

However, the decision to defend or invade another area is not always a matter of rational analysis of costs and benefits. Feelings of ownership, honor, revenge and a lust for power enter in. When people are very angry, they will sometimes take actions which are very costly. In other cases, people will get worn down with hatred and conflict and acquiesce out of fatigue.

Changes in Territoriality: Three Stages

Stage I: Origins of the System

The territorial system in Maine at present is the result of a long historical process in

which some territories have remained intact, while other have been consolidated into larger nucleated territories.

Fifty years ago lobstering was done only in the summer in very small territories occupied by small groups of men. In great part, this pattern is traceable to the technology in use which made it difficult to fish in distant waters, and unnecessary to do so. Since lobstering was done from a small dory or a sailing sloop between 18 and 30 feet long, fishermen could not fish in the stormy winter months far from home. Even in the summer, men placed their traps close to their home harbors to minimize travel time. Travel to and from fishing grounds even three to five miles distance could take several hours per day. If there was no wind, or one had to tack upwind for long distances, it could take even longer. At that time, there was no need to fish a large area. One could only tend a small number of traps since they had to be pulled to the surface by hand or by using the old style gasoline powered winches. The average fisherman only had 100 traps, and many men could not tend that number. Moreover, the fact that one could only learn the bottom by using a handline further limited the amount of area a person could know and use efficiently.

While there is no record of how the territories came into being, information from a few older informants gives us some inkling about the process. Several informants said that lobster fishermen usually used a small area near their home harbor, or an island they owned. They used the same waters for years on end and defended them vigorously. "My grandfather had his own little patch" one said, "and he didn't go outside of it." Another said that each of the islands in between Georges Island and the mainland had a camp on it where the island's owner (or the person who rented fishing rights) stayed during the summer. They fished no more than a mile from the island and you were advised to stay out of their little kingdom. One of these islands

were owned by the Teel family and "you did not fool with old Henry Teel much." From comments such as these, it is reasonable to assume that they got to know the area where they fished well, came to feel dependent on it for their income. At some point usufructory rights strengthened into a sense of ownership, giving people justification for defending the area against the incursions of others. One old man said of the fishermen he knew as a boy in the 1920's, "Since a man's whole income was dependent on a small area, they felt justified in keeping other people out. They had their own areas after all." The generation of people who started the territorial system probably felt the same.

However, the evidence is inconsistent regarding the feelings of territoriality and the amount of violence involved in defending these areas. One person said that his grandfather "used to row to an island in upper Muscongus Bay where he would live in a camp and fish for lobsters all summer. He never mentioned any lines or territories."

In the minds of these informants, ownership of fishing area was tied to legal ownership of land. Almost certainly these small areas were adjacent to the fisherman's own property, and legal ownership over the land was extended to include nearby waters. Older informants also have said that these areas were owned by one man or small groups of kinsmen, and fishing rights were inherited with legal title to the land.

Apparently the territorial system was well established before 1900. A 1907 newspaper article entitled "Clans of Lobstermen Threaten Bloodshed"(Anonymous 1907) describes the events that took place when interlopers on two mainland boats came to Monhegan and set traps island waters for two days. The Monhagan fishermen were so infuriated that "no stranger dares venture ashore." The article goes on to say that "the Monhegan fishermen have always looked

upon lobster fishing around the island as their exclusive right." The article leaves little doubt that the Monhegan fishermen in the past had defended their territory by cutting traps. "In some mysterious manner, their lobster warps would be cut and their pots would be lost, and altogether the damage to their gear would be more than the lobsters taken would pay for."

In short, the first fishing territories were small, close to shore, fished mainly in the warm months of year, and vigorously defended by their owner or owners, who were usually close kin. Much of this pattern has persisted to the present day in the perimeter defended areas, and in some of the mainland harbors on the shore of Penobscot Bay. On the mainland, especially in the western part of the study area, this pattern has completely broken down. Very small territories have been combined into larger territories whose boundaries are not vigorously defended and where most ocean area is fished by people from at least two harbors. In Muscongus Bay, Casco Bay and the area in between, most men fish much of the year in zones where mixed fishing is allowed. In short, the territorial pattern we see at present is due to the fact that perimeter defended areas have been maintained in some areas, and have been amalgamated to form nucleated territories in other places. What we need to understand is the factors producing this differential breakdown of territorial boundaries.

Stage II: Consolidation of Fishing Territories

In the western part of the study area where the coast is strongly convoluted and formed into deep bays, the traditional areas of communities on open ocean have been under considerable pressure from people in the towns further up rivers and bays. In the World War II era, fishermen from towns on the outer peninsulas (e.g., Port Clyde, New Harbor, Boothbay Harbor) were able to fish at least nine months a year. They had ample "shedder" bottom to occupy them in the

summer and access to deeper waters further offshore where they could catch large amounts of lobster in the fall and spring. By way of contrast, fishermen from towns up bays and estuaries such as Bremen, Searsport and Wiscasset had to restrict their fishing to the summer months when they could catch lobsters in the shallow waters adjacent to their home harbors. During the course of the past several decades, fishermen from such bay communities have been purchasing boats capable of going to open ocean. If these people are going to fish on a year-round basis, they must fish in deep water. This means they had to invade what were formally exclusive territories of towns such as New Harbor, Little River and Five Islands on open ocean. Those from river communities were willing to sacrifice a great deal to get to deep water. The alternative was to be bottled up in the small traditional territories adjacent to home harbors, where they could fish only a few months a year.

For the fishermen in invaded areas, it was not worthwhile to repel the invaders. It is true that invasion meant that people from harbors on open ocean had more competition in the middle of bays where they fish in the fall and spring. Some of them complain about getting smaller yields as a result. However, an attempt to stop people from up-river from their incursions would mean a full-scale war, involving large financial losses. Even though there was a good deal of bitter talk, those from open-ocean harbors felt it was better to mix than fight.

In Muscongus Bay, for example, fishermen from up river towns moved into the lower bay over the course of two decades beginning in the late 1950's. In some cases, their incursions were relatively peaceful; in others some small scale trap cutting took place. During 1950's fishermen from Bremen had small skiffs which they used in the Medomak River. In the 1960's a number of Bremen fishermen bought larger boats, and were able to take over the Loud's Island area when

permanent inhabitants moved to the mainland. Then they were able to fish in the area in the middle of Muscongus Bay in the fall and winter, an area that had long been fished jointly by people from New Harbor and Round Pond. Their move to the south was stopped once they reached the Monhegan line, a perimeter defended area. David Autio of Bremen recalls these events in the following words:

I started fishing in the river when I was 11 [1957] and had ten traps. When I was a kid, there were no power boats here. [He admitted there were a few power boats later]. Ninety percent of them [Bremen fishermen] stayed within here [area around Hog Island with a boundary at Hockamock Point on the north and Hog Island bar on the south]. They used to fish about 100 traps or so. In the 1950's and early 1960's there was still a settlement on Loud's Island. They had an area on the east side of the island near where they moored in Little Harbor. Then I got a new boat with a hydraulic hauler and more traps. Then some of us younger guys with new boats moved in more. They [the people from Louds Island] were moving off the Island and they were old. We had 250 to 300 traps per person. They moved off the island and we just swarmed all over it.

Then we started moving down the bay as the season progressed. Other guys from Bremen and Round Pond did the same. Down south west of Moser Ledge was New Harbor, Friendship and Bremen; they all mix to the Monhegan line. I had some trouble when I came down [the bay]. I never had to resort to anything. If you hit the Monhegan line, they are bad. They would cut you. That was pretty much the end of intense territoriality in the mouth of the bay.

This is the view of a man who was part of a group that gained a good deal of fishing ground without having to resort to much violence. He was clearly happy with the results. The people from towns on the ends of peninsulas, who were invaded, had a different point of view. They were quite bitter about seeing areas they had fished opened to mixed fishing with people from up river, but they did not find it worthwhile to defend these areas. Their response was to move up river in the following decades. Their rationale is that if men from places such as Bremen and Friendship are being permitted to come down to fish in the middle of Muscongus Bay and the open ocean to the south, they, in turn should be permitted to fish further north in the

upper reaches of the Bay. Accordingly, New Harbor and Round Pond fishermen began to move their traps north of the traditional line in the summer months to get access to more shadder bottom. Interestingly enough, this has met with very stiff resistance from the Friendship and Bremen fishermen. In the late 1990's, the area around Jones's Garden has become a very contested piece of bottom. The irony of the situation has not been lost on one New Harbor fisherman (Eddie Drisko) who said, "What is good for the goose is not good for the gander. It is okay for them to come down here in the fall [southern part of the bay], but it is different when we go up there in the summer. One guy from Friendship is the worst. He puts an enormous gang of traps off here [off New Harbor] in the fall, but he is the first one to cut us when we go up there in the summer [i.e., north of the old New Harbor line]."

In other estuaries, the same process has occurred, but with less violence. Fishermen from Five Islands and South Bristol are fishing much further up the Sheepscot and Damariscotta Rivers, respectively, while men from up river communities are able to come south and fish in open ocean in the fall and winter.

In these areas, an increase in areas where mixed fishing is allowed resulted from conflicts between gangs wanting to increase access to bottom which would allow them to fish more months of the year. Here again, the success of invasion attempts depends on the organizing ability of team and their willingness to incur losses. Sparky Pierce recalls ruefully his unsuccessful attempt to defend the Sebasco Estates territory from incursions by men from West Point. "The two areas merged because they [West Point] pushed and we didn't stop them. I spoke to people [to get them to defend the area]. But other people let me do it [cut the offending

traps]. I took the hit. So I gave up and said I'd come down here. I was the only one being open with it. I felt they should leave us alone where we hadn't bothered anyone. Up in the river gets lobsters first so we had it good when they didn't. They would come up, but when ours quit, they didn't want us down there." The Sebasco fishermen did finally succeed in pushing into West Point territory in the fall. As a result, both areas have merged for all practical purposes.

There is much less mixed fishing in mainland harbors in the eastern part of the study area. In towns such as Spruce Head and Tenant's Harbor, people can fish near their home harbors in the summer, and then go out in the middle part of the bay to fish in their winter fishing grounds there. This gives them both shoal water and deep water, so that fishermen from these communities can fish all year round without having to enter the territories of islanders in the Muscle Ridge Channel or in the middle of Penobscot Bay (e.g., Vinalhaven, Green Island, Metinic, etc.). Although the waters of the islands are attractive to mainlanders, they are never faced with the alternatives of ceasing operations during certain seasons or entering waters adjacent to other mainland harbors or the islands. Since lobstermen in these areas are not forced to violate boundaries to make a living- year round, the mainlanders have not been so desperate that they have been willing to assume the cost of invading other areas. Thus ,boundaries have been easier to defend so that the amount of territory fished exclusively by men from each harbor remains relatively large.

The perimeter defended areas have remained the exclusive fishing ground of gangs fishing off those islands. The lines of these island areas are tested every year by mainlanders placing traps over the boundary. There have also been a numbers of more serious attempts to invade these island areas , some of which have resulted in the boundaries being changed to give

mainlanders more fishing area. But the perimeter defended areas still exist even though some of them contain less fishing area than formerly.

Stage III: Recent Changes in the Territorial System

In the 1980's and 1990's a number of changes took place in lobster fishing and the legal environment surrounding lobster fishing that are having a marked effect on the territorial system.

Trap Escalation. Since the 1930's there has been a steady increase in the number of traps in use.

In 1960 there were 745,000 traps in use; by 1980 the number had more than doubled to

1,846,000; by 1999, the number had increased to 3,045,000 traps. This increase in traps has

continued even after trap limits were imposed beginning in 1995.

As we shall see in Chapter 7, this increase in traps is due to a complex combination of factors. At this point, let it suffice to say that the increase in traps was made possible by the adoption of technical innovations such as the hydraulic trap hauler, larger boats, nylon heads, and electronic equipment which allowed fishermen to maintain and tend a lot more gear. A number of non-technical factors motivated large numbers of fishermen to increase the numbers of traps they used. Foremost is competition between fishermen. In every harbor, some would put more traps in the water to increase the proportion of traps they had on the bottom and their incomes. Others would follow suit in an attempt to keep even, which would, in turn, motivate others to put in still more. This never ending cycle has gone on for the past fifty years. In some places such as Casco Bay and Penobscot Bay (before 1995) it was common for people to fish 1800 traps and gangs of 3000 were not unheard of. The second factor was an increase in the number of full-time lobster fishermen as people moved out of the failing ground fisheries, scallop fisheries, etc. into the booming lobster fishery. While the number of fishermen remained approximately the

same, a very large number of license holders, who had been part timers earning their living in other industries, have become full time lobster fishermen, using far more traps.

The increases in traps have led to increasing trap congestion. This trap congestion is especially bad in the nucleated territories on the mainland, which have experienced an increase in fishermen in recent years, who are using more traps per capita on the average. As a result, fishermen from mainland harbors have felt under considerable pressure to increase the area they fish to places so saturated with traps that they become entangled and catches are lowered. The perimeter defended areas around islands have not experienced such an increase in trap numbers. Here the number of traps in use has increased, but not to the same degree. As a result, islanders do not feel the same pressure to increase the area they fish.

Law Enforcement. Over the course of the past three decades law enforcement efforts have become far more effective. In part this is due to the increasing professionalization of the warden force as a result of better leadership in the Department of Marine Resources, increased enforcement budgets, and better training.

But more important, people in the industry have become more committed to conservation, and they are much more likely to report infraction of the law to the wardens, including trap cutting incidents. Moreover, in the eyes of an increasing number of fishermen cutting traps is increasingly seen as reprehensible. As a result, the warden force is having far more success in enforcing such violations of the law. It is true that it is still difficult to get evidence that will stand up in court, and many victims, when evidence is available, are reluctant to prosecute, preferring private retaliation. But the probability of being punished for trap cutting has increased, and everyone knows that cutting traps can lead to a fine, loss of license or even

time in jail. In 1998, one man from the Penobscot Bay region was convicted of cutting off some 500 traps. He was heavily fined and sent to jail. This would not have occurred thirty years ago due to the code of silence that prevailed in the industry at that time (*check with Robin.*)

The increase in effectiveness of law enforcement has made people far less likely to engage in trap cutting. One man from an island whose territory was being invaded by mainlanders was heard to remark, "In the good old days we would have taken care of the problem with the knife, but this isn't the good old days."

Ecological Changes and the Location of Lobsters. There have also been ecological changes that have altered when and where lobsters can be profitably caught. In the past, winter was a very unproductive time to fish. Many lobsters were in near hibernation, and so few crawled into traps that many people did not fish at all in the mid winter months. For the past several years in the "boom" period, a large enough number of lobsters can be caught in deep water on mud bottom to make it worthwhile to fish in the winter. To be sure, winter fishing is still not as productive as summer fishing, but now many fishermen with large boats find it worthwhile to fish 10 and 15 miles from land where very few, if any, fishermen went before.

As a result, fishermen with large boats and big gangs of traps are spending a lot more time and effort exploiting offshore, deep water areas. These areas are relatively uncongested with traps, and have a lot of bottom which is now moderately productive in the winter months. For example, people from Spruce Head are fishing large numbers of traps the winter south of Matinicus Rock, some thirty miles from their home harbor. Boats from Portland and other towns in Casco Bay have been going to offshore areas southeast of Cape Elizabeth.

There has been no attempt to incorporate these areas into the traditional fishing areas.

The offshore areas have always been open to all. They remain so. This means that the size of the traditional fishing areas has not expanded. What has increased greatly is the size of the exploited area which is open to all fishermen from all harbors. An increasing number of fishermen are spending a lot of time exploiting waters that are claimed by no harbor, and where they do not have to worry about infringing on territorial boundaries. More than one fishermen has said that they like this situation.

Moreover, it is unlikely that these fishermen will begin to defend these offshore areas when enough time goes by. The usual way to defend territorial claims is by trap cutting, and this is becoming increasingly risky and unprofitable. These offshore areas are exploited, typically, by people from several harbors. If fishermen from one harbor attempted to drive out people from the others, there would likely be a major and very costly battle which would almost certainly result in intervention by the warden force and police. Moreover, there is little to be gained by driving other fishermen out of such areas. Traps are placed so far apart that tangles are not frequent, and the traps of other people do not reduce your own catches.

Second, in inshore areas, these changes have resulted in increases in the amount of area where mixed fishing is allowed. The increases in the number of traps in use and the larger and faster boats have resulted in more fishermen placing traps in waters that were the exclusive zone of other harbors. An increasing number of these incursions have been successful due to changes in the cost/benefit ratios faced by aggressors vs defenders. People who invade other areas have much to gain in the from greater access to increased bottoms at certain times of year, and the chances of facing effective resistance are less than they were in the past. The people whose boundaries have been violated have less to gain from a successful defense, in comparison with

the possible losses, which can include loss of license, a fine or even time spent in jail.

This is not to suggest that boundaries demarcating the exclusive area held by harbors are undefended. There have been some nasty fights over such incursions, such as the one currently going on in Muscongus Bay over the area north of Jones' Garden. Even further offshore, incursions into areas where mixed fishing are permitted meet with substantial resistance. In the mid 1980's, a group of fishermen from Cushing, Friendship, and Port Clyde began to place traps in an area in outer Penobscot Bay south west of Matinicus. People from Tenant's Harbor, Wheeler's Bay, Spruce Head ,and Martinsville, who had been fishing this area jointly for a long time, got together with some of the intruders and forcefully said that their incursion could not continue without trouble. A line was established, primarily by negotiation, establishing a boundary running south east from Mosquito Head just south of the 12810 Loran C line. Boats from Cushing, Friendship, and Port Clyde do not come north of that line. What is unusual about this case is that a boundary line was established by negotiations rather than trap cutting. I suspect that many more boundary disputes will be handled in this way in the future. It is also one of the few cases I know about where people from two or more harbors have been able to get together to defend a boundary.

The Islands. Increasingly, island territorial boundaries are under pressure as large numbers of mainland fishermen from crowded mainland harbor feel compelled seek additional fishing grounds further from their home harbors. They have successfully invaded parts of the territory of various islands with the result that there has been some movement in the boundaries of those island. This is true even in perimeter defended areas, which have been successfully defended for so many years. The eastern boundary of Metinic has been moved to the west by a quarter of a

mile reducing the area fished by the men on that island; the eastern Green Island line is under assault and may well move somewhat to the west, while the men from Wheeler's Bay and Spruce Head have successfully pushed a wedge shaped area into an area that hitherto had been fished by men from Matinicus and Vinalhaven. In all these cases the incursions have ceased to be opposed by the defending islanders and are likely to be permanent. On some of these islands a bunker mentality has begun to develop as the islanders face constant attempts to invade their areas and more effective law enforcement makes defense more difficult.

Swan's Island and Monhegan have succeeded in defending fishing areas by the novel ploy of going to the government. As we shall see in Chapter 3, these island communities had a number of political goals. A desire for a trap limit was perhaps primary, but defending the island's traditional fishing territory was high on the list.

In 1984, Swan's Island, under increasing pressure from mainland fishermen and experiencing increasing trap escalation itself, was able persuade the commissioner of marine Resources, Spencer Appolonio, make the traditional fishing area of Swan's Island a "conservation zone." In 1984, the Swan's Island Conservation Zone was formed by the Commissioner using his regulatory authority, after he was convinced that this idea was supported by a near consensus of people on the island and that fishermen from adjacent harbors supported it as well. The conservation zone is administered by a committee of four local fishermen elected by the Swan's Island lobster license holders and one member appointed by the Commissioner of Marine resources. The rules specify the boundaries of the zone and state that all those wanting to fish in the zone would limit themselves to a certain number of traps or face prosecution. In 1984, people were limited to 350 traps, but the trap limit has been changed several times since. In

1999, it was 450. People from other harbors would be allowed to fish in Swan's Island waters, providing they obeyed the Swan's Island rules. This, of course, means that the onerous job of enforcing the boundaries around Swan's Island where the trap limit is effect has been given to the warden force. For all practical purposes, Swan's Island has a limited entry program. Access to the island's fishing zone has long been reserved for members of long established families on the island. While any fisherman from any harbor is technically allowed to go fishing in the Swan's Island conservation zone if they obey the special rules of the zone, in fact only a few fishermen from the surrounding mainland harbors do so.

In 1995, Monhegan was also successful in getting a conservation zone. Along the coast of Maine, no harbor gang has done as good a job in curtailing its own exploitive activities than the lobster fishermen of Monhegan. They have long recognized that the island's waters contained a limited resource. Accordingly, in 1907 they successfully lobbied the Maine legislature for a law to allow no fishing in Monhegan waters from July 1 to December 31; that law remains in effect today. In 1972 they imposed on themselves a limit of 600 traps. They have only allowed residents of Monhegan to go lobster fishing, so that the number of fishermen has remained between ten and twelve. In short, Monhegan has a closed season, a trap limit, and a limited entry rule (Acheson 1998: 43-52). No other lobster fishing gang has imposed rules this severe on itself.

Throughout most of the 20th century, Monhegan's lobster fishery remained inviolate, protected by distance and the knowledge that invasion of the island's waters would bring certain destruction of the invader's lobstering gear.

In the past 20 years, trap escalation forced many men from mainland harbors to place

traps where they have not placed them previously. By the mid 1980's men from mainland harbors were regularly fishing well to the south of Monhegan in waters where only Monhegan fishermen had fished.

In the spring of 1995, Friendship fishermen began to invade Monhegan waters with large amounts of traps. When Friendship traps disappeared in a series of "killer fogs," Monhegan traps were sliced of in a series of retaliatory raids. A Monhegan boat was sunk at a mainland dock under circumstances the sheriff's department ruled "not accidental." (Kyle 1996: 1). According to local rumor, this boat was sunk in a retaliatory foray. The wardens were called in, prosecuted one Monhegan fisherman for trap cutting, and made it apparent that they would not tolerate any more trap cutting incidents from either side. To protect their traps, the Friendship fishermen anchored a large dragger in Monhegan harbor where they lived while they guarded their traps. The Commissioner of Marine Resources entered the fray, and on July 17, 1996 got both sides to come to an agreement specifying that the Monhegan traditional two mile zone would constitute a "Conservation Zone" and that this zone would be extended to the southward for one additional mile, under the condition that Monhegan would maintain its seasonal closure and trap limit, and allow other fishermen to fish in its zone if they were willing to abide by the strict Monhegan lobstering rules.

In the summer of 1997, five fishermen from Friendship applied to fish in Monhegan waters as they were permitted to do under the terms of the agreement. The Monhegan fishermen, decided, agreement or no agreement, that no one else was going to fish in their waters. Immediately, the Monhegan fishermen began to lobby against permitting Friendship fishermen to place traps around Monhegan. They pointed out that the addition of five fishermen would

increase the number of traps in Monhegan waters by 60 percent, destroy the resource they have preserved, and make it impossible to maintain a year round community on the island. The Friendship fishermen, for their part, countered with the argument that there are ample lobsters around Monhegan and that they have a legal right to fish in those waters. The Friendship fishermen also noted that their actions are prompted by overcrowding in their own traditional territory. Both sides threatened violence if opposed.

In 1998, after months of trouble and endless debate in the newspapers and on docks, the Monhegan fishermen successfully lobbied the legislature to establish a conservation zone where only people who lived on the island could fish. This law established a zone which is two miles around the island (except on the southeast, where a 2.5 mile boundary exists). In this conservation zone a 600 trap limit holds, and fishing is only permitted from December 1 to June 25. In addition, only fishermen who have passed a special apprenticeship program on Monhegan can obtain a commercial lobster license to fish in the island's waters. The number of licenses issued is limited to the number of licenses issued for Monhegan in 1997.

The Monhegan-Friendship dispute attracted a good deal of interest from the press which was as interested in the prospects of a violent "trap war" as in serious issues of management. Public sentiment and newspaper commentary tended to side with Monhegan. The general public seemed to be persuaded that Monhegan fishermen had done a good job in establishing rules to curtail their own exploitive effort, and that Friendship fishermen should not be rewarded for over fishing their own traditional waters with permission to fish in the waters of a more conservation minded island. The fact that the Friendship and Monhegan fishermen had a formal agreement was largely forgotten.

The Marine Resources Committee of the Maine Legislature held public hearings in late January and early February 1998 and the Legislature passed a bill establishing a special conservation zone for Monhegan in February. A number of other islands, including Isle au Haut, encouraged by Monhegan's success, were seriously discussing establishing such conservation zones around their own islands. However, the lobbying and hearings on the Monhegan Conservation Zone were so protracted, and divisive, that the bill the Legislature passed also had a provision that a special commission would be established to recommend some way to handle other requests for conservation zones or sub-zones with special rules and boundaries. Clearly they were not interested in going through any more legislative tussles over establishing other sub-zones. This so called "Sub-zone Task Force" met during the summer and fall of 1998, and issued a report stating that "sub-zones were to be discouraged at this time" (*Commercial Fisheries News* 1998b: 21c). This conclusion was clearly one that was desired by officers of the Department of Marine Resources and members of the legislature who had come under considerable constituent pressure concerning this issue.

Thus, the conservation zones established around Swan's Island and Monhegan stand alone. It is important to note that these two islands have defended their traditional fishing areas by unusual means. They have maneuvered the legislature into formalizing traditional territories, and using the state wardens by agreeing to the most stringent conservation rules in existence in the industry.

The Effect of the Zone Management Law

In 1995, the Maine Legislature passed what has become known as the "Zone Management Law for the Lobster Industry." This law changes many aspects of the legal

environment of lobstering. It is a true co-management law which divides the coast into zones and gives substantial power to manage the resource to elected zone councils and the license holders. This law will be analyzed in great detail in Chapter 5. This law has had some effects on the territorial system and will likely have more influence in the future. It is appropriate to describe those changes here.

When the Zone Management Law was passed, few people thought the imposition of zone boundaries would cause a major problem. After all, the law stated that people could fish on both sides of a zone boundary line. If there was a difference in rules between the zones, they could fish on both sides provided that they followed the rules of the more restrictive zone. Moreover, the zone boundaries were set in 1996 by interim zone councils and they placed them in places which followed traditional boundaries.

However, by the year 2000 five of the seven zones were embroiled in zone boundary disputes.. The first serious dispute concerned the waters off Pemaquid Point, the boundary between zones D and E. Throughout 1998 and early in 1999, the dispute simmered as fishermen from zone D and E each tried to negotiate a line giving them more fishing territory. This dispute was settled late in 1999 and early in 2000 by fishermen from both sides agreeing to a "buffer zone" off Pemaquid Point where people from both zones could fish.

Zones C and D are embroiled in disputes over two areas. One was an area close to Vinalhaven where fishermen from Wheeler's Bay (Zone D) had successfully invaded an area previously fished by Matinicus and Vinalhaven. The Matinicus and Vinalhaven fishermen wanted them out. They argued that the zone boundary was drawn in such a way as to place the contested area in Zone C, in their efforts to dislodge the men from Zone D from an area that had

once been their own. This dispute was settled in 1999 by negotiating a formal regulation establishing a buffer zone. The other dispute came about as a result of a change in the law in 1999, which made it illegal for fishers to place more than 49 percent of their traps in the waters of another zone. Several "big fishers" from Spruce Head were particularly incensed, since this rule prohibits them from placing a large number of traps south of Matinicus Rock where they had put traps for the past several years. By the fall of 2000, this dispute has not been settled. In both cases, fishermen from Zone C favored the original boundary and the rules since it gave them access to more area; men from Zone D wanted changes because the rules disadvantaged them.

The third dispute is between zones F and G over waters in the Cape Elizabeth area south/south west of Portland. Fishermen from Zone F have long fished very large amounts of gear in the winter in these offshore waters which are now part of by Zone G. Fishermen from Zone G want the existing boundary line and rules to remain intact to keep the Zone F men out of what is now their zone. The zone F men are agitating mightily to be permitted to fish where they have gone for a number of years.

In all of these cases, the underlying problem is distributional issues that have resulted from a formal zone boundary being put across a "mixed fishing" or offshore open area. The zone boundaries have changed where some fishermen can place traps, especially offshore. This has resulted in intense politicking concerning zone boundary lines. Fishermen from one zone want the boundary lines and rules changed to give them access to traditional bottom. Others want the lines and rules to remain as the same because they have gained in the process. Zone boundary lines and their placement, in short, is being used as ammunition in competition over territory.

Territoriality in 2000: A Nickel Overview of the Central Coast

Over the course of the twentieth century, spatial strategies and the territorial system have undergone substantial change. An increasing number of fishing areas have been consolidated, boundaries have moved so there is much more area where mixed fishing is allowed., and much more lobster fishing area is outside the area where territoriality exists.

There is, however, an enormous difference in the amount of change that has occurred in various parts of the coast. In Casco Bay, the territorial system has been greatly changed. Many areas have been consolidated, and in much of the bay "mixed fishing" is permitted. There are no impediments at all to placing traps in the deep water outside the bay, save for the formal zone boundaries. Yet, even here there are places one cannot place traps without courting trouble. On the offshore islands (e.g., Long Island, Chebeague, Cliff), shedder bottom is still defended by the islanders, and in the upper reaches of some of the rivers small exclusive areas are maintained and defended by their traditional owners. There is still a boundary between the Harpswell and the Casco Bay islands. Fishermen from Harpswell do not go west of Whaleboats Island, and those on the islands do not go to the east of it. In the eastern part of the bay, Harpswell, Bailey's Island, Cundy's Harbor, and Sebasco Estastes all defend areas close to their harbors, but fish together in the fall and winter in the outer part of the bay.

In the central coast, most of the inshore fishing grounds have been consolidated into areas where mixed fishing is allowed. (Again, these areas are not open to just anyone.) In fact, people from places such as Port Clyde, Davis Point, Friendship, Bremen, New Harbor, Pemaquid, South Bristol, Little River, Boothbay Harbor, Southport, and Five Islands have no area they fish exclusively, except small area is very close to the mouth of their home harbors. Again, in the

deepwater areas offshore, no territorial boundaries are defended at all.

In the upper reaches of Penobscot Bay much the same pattern persists. Here most of the area is fished by men from at least two harbors. In the summer, there are small areas along shore which are defended by people from adjacent harbors. In the fall and winter, however, people range far and wide. People from Belfast and Searsport regularly fish 15 miles down the bay in the region near Great Spruce Head Island and Butter Island, just to the north of Vinalhaven.

The exception is the area at the mouth of Penobscot Bay where a large number of perimeter defended areas have been maintained and successfully defended for generations. Islands such as Criehaven, Green Island Little Green Island, Metinic, Monhegan and the Islands in the Muscle Ridge channel all maintain large areas where people from those gangs fish thorough out the year. Those boundaries are defended with vigor. There are areas in the middle of the channel of Penobscot Bay and further offshore where "mixed fishing" is allowed, but the proportion of mixed fishing to exclusive area is much smaller in this area than any other part of the study area.

Figure 3.1 goes Here.

Lobster Territories in the Mid Coast Area: 2000.

The Development of Lobster Fishing Areas: a Game Theory Analysis

game theory analysis goes here

The Construction of Territoriality

In the 1970's when I first began to interview people about spatial strategies and

territoriality, people would admit that such a phenomenon existed with little urging. Some were openly boastful about the role they played in territorial defense and incursions into the areas of other harbor gangs. Others would talk in general terms about lines, but were less than helpful when it came to describing the seamy side of territorial defense. By the summer of 1998, when graduate student Jennifer Brewer and I began to gather data on territoriality again, much had changed. Many people, especially in the central and southern regions, were quick to tell us that there were no boundaries and that territoriality had disappeared. Two weeks of intensive interviewing convinced us that the territorial system was very much in existence. In some places it had changed, but in others it is virtually the same as it was in the mid 1970's.

Territoriality is not only a system of rules and practices, it also has an ideological side. This ideology is a contested construction. That is, the way people select facts about territoriality and interpret those facts is influenced by their own interest to one degree or another. Wishful thinking, attempts to be totally accurate, and strategic reporting all influence the stories we heard about territoriality. There was also a normative aspect to such reports. Reports about territoriality reflected what people thought was "right" and what "should be." Reports were also influenced by knowledge of the increased law enforcement efforts, which they knew made boundary defense more difficult. To a large extent, people generalized from what they knew about, namely the conditions in their own local areas..

There was a marked difference in the reports of people from areas where nucleated territoriality existed as opposed to perimeter defended areas. People in nucleated areas played down territoriality. Some even said there was no territoriality. These people are impressed with the fact that there is more mixed fishing area now, and that fishermen are spending a lot more

time in open ocean areas where there is no feelings of ownership. They also know that some people can exploit areas where others cannot go so that, in their minds, "there are no lines." Others said there were no lines, meaning that there should be no lines or that they hoped there would be no lines.. Of course, it is one thing to say that people are fishing more area offshore where there is no territoriality, that there is more "mixed fishing," and that boundary defense is more costly. It is entirely another to insist that no territoriality exists at all.

Some in the same harbor would report boundaries encompassing far more area than others reported. On the whole, these were older fishermen, who were reporting how the situation might have been, and hopefully would be again.

. Fishermen from up-river towns, who had to fish in the middle of bays in the winter would almost inevitably report the "boundaries were weakening" or that there were no territories. This is a rationalization for their own actions, which involve fishing in areas others considered their own. Men on the ends of peninsulas were far more prone insist that territoriality existed, and to describe their own harbor area in generous terms with relatively little mixed fishing area. In several instances it was obvious that such descriptions were part of an ideology justifying defending territorial lines that were under pressure from people up river. After all, an area over which they had "rights" was being invaded by people who had no "right" to be there.

Political considerations played a role as well. People's descriptions were tailored to their political agendas. They did not want a report which supported a legislative effort of which they did not approve. Time and again, we heard "this isn't going to be used to make a law is it?"

People in perimeter defended areas, without fail, emphasized that the territorial system was alive and well. They emphasized the longevity of this system, and linked their rights to

ocean area to the ownership of island land. Their reports were clearer and definitive. They had boundaries, they had always had boundaries, and they defended them. Their reports were not clouded by issues such as "mixed fishing" and the fact that some people could not go where others could. Sometimes the political agenda that lurked under the surface of these reports came to the fore. They said they hoped that their perimeter defended boundaries would endure. After all, islanders had no other way to earn a living and they were doing a good job conserving the resource. We were assured that only they limited entry, and had trap limits imposed through "gentleman's agreements."

The islanders' reports were clouded by what was a siege mentality. They said they hoped they would always have these territories, but they were clearly worried about the increasing incursions by mainland boats and that the warden force was making defense difficult. They tended to slide over the fact that their boundaries were sometimes defended by illegal actions.

The information we obtained on territoriality and boundary defense was complicated, and contradictory in many cases. It is an area where more research needs to be done.

Conclusion

The Maine lobster fishery is a common pool resource. Like all common pool resources, the lobster fishery faces two problems: it is difficult to limit access to the resource, and subtractability exists so that use of the resource by one person results in less of the resource for others users (Ostrom, Gardner and Walker 1994: 7).

The common pool status means that the lobster industry lies somewhere between open access regimes on one hand and private property regimes on the other. They are not like the private property regimes where a sole owner has the right to appropriate all of the resource and a

strong incentive to protect that resource and invest in it. But they are also not like open access regimes where a complete lack of property rights leaves the resource open to exploitation by anyone and everyone leading to massive over exploitation. In these common pool arrangements, people have some ability to control access and can, with difficulty, erect rules to restrict exploitive effort. In the Maine lobster industry, the harbor gangs been able to reserve a portion of the ocean for their own use and have been able to control entry to their own "gang" to one degree or another. This certainly decreases competition for lobster and increases the catches per unit of effort for those who are admitted to the common pool (i.e., gang). In the absence of these rules, the catch per trap would be less. These rules give some, but not all, of the benefits associated with private property.

However, all of the institutions concerning territoriality are under assault, particularly in the nucleated areas comprising most of the state. In the nucleated areas, the barriers to entry have been lowered, with the result that it is far easier to join these harbor gangs. As the number of fishermen in these harbors have increased, congestion and tangles have increased, while catches per unit of effort have declined. In addition, fisherman from nucleated harbors are using a lot more area.. Harbor gang territorial lines are being pushed back, resulting in more "mixed fishing" as some harbor gangs are successful in invading areas other gangs do not find it worthwhile to defend. There is also a lot of fishing now being done in open ocean where no territoriality exists at all. This expansion has been made possible by better technology, including bigger, faster boats and innovations making it possible to pull more traps. The expansion has been aided by more effective law enforcement which has made it costly to establish and defend boundary lines.

The effect of these trends is that institutional rules do less and less to conserve the

resource for those fishing nucleated areas. In nucleated areas, there is less area per boat, and more traps per unit of area, resulting in a smaller catch per unit of effort and smaller lobsters caught as well. In the perimeter defended areas, territorial boundaries have been defended better and entry to gangs has been restricted with the result that catches per trap are higher, and the stock density in these areas is greater. In short, the conditions in nucleated areas are increasingly closer to the conditions of open access regimes and thus have more of the problems associated with open access regimes. Perimeter defended areas give more of the benefits of private property.

However, the people in perimeter defended areas have their own problems. The cost of maintaining these areas has become higher as ever-increasing numbers of boats from the mainland continually push the island lines and increased law enforcement makes boundary defense more risky.

As a result of all of the erosion of informal rules and practices, lobster fishermen have been turning increasingly to the state to get the rules they want. Since informal rules to limit entry into harbor gangs have broken down, the industry has gone to the legislature to get laws restricting entry. The result is limited entry and the apprenticeship program which came about as part of the new Zone Management Law. Entry into the industry does not depend solely on the ability to get accepted by a harbor gang; now it is dependent on passing the requirements of the apprenticeship program and getting a license. The Zone Management Law has also resulted in trap limits and the division of the coast into zones, which restrict where people fishing near boundaries can fish.

This signals an important change in the lobster industry. In the past, who could fish for

lobster, where they could fish and how many traps they could use was dependent on rules and arrangements generated informally by groups of fishermen and harbor gangs. Increasingly, these same issues are being determined by the power of the State of Maine. Informal rules are giving way to formal rules.

There are many in Maine who believe that we are witnessing a fundamental change in the traditional territorial system. Some think the system will no longer exist in a few years.

Notes

1. Maine had a long tradition of holding all fish in lakes and rivers and animal resources in public trust. The "great ponds" law allows anyone to travel over privately owned property to any pond over 10 acres in size to fish and "fowl." All these laws have been tested in court in recent years; all have been upheld. By law people are allowed to hunt on private property without permission of the landowner.

2. The formula is catch in pounds/ traps hauled x lay over days. **(Do as a formula.)** This measure takes into account the number of times a trap is pulled and the time the bait has had to work. It cannot be assumed that two areas producing a pound of lobster/ trap have the same number of lobsters on the bottom if the traps in one area are pulled every day and those in another are pulled weekly.

Section for Chapter 3 Towns Without Informal Trap Limits.

None of the towns on the mainland have developed informal trap limits. Data gathered on four of these communities, Spruce Head, Pleasant Point (Cushing), New Harbor, and Boothbay Harbor reveals that they have a very different set of characteristics than the islands that have developed trap limits.

They have larger populations and are spread over far larger areas. The smallest is Spruce Head with a population of 719 permanent inhabitants; the largest is Boothbay Harbor with 2648. Moreover, the population of these towns, like all towns along the Maine coast, explodes in the summer months. The shore front property of all of these townships is lined by cottages, which are sometimes only a few feet apart. No good summer census exists, but there is no question that the summer population of these communities is several times what the winter population is. In the summer months, it is estimated that Boothbay Harbor has at least 10,000 people while Cushing has an estimated 2000.

Nevertheless, three of these four communities have retained a decidedly rural and quiet atmosphere. These towns are down peninsulas, and their inhabitants do most of their shopping and obtain services in the nearby small cities along U.S. 1, such as Brunswick, Bath, Damariscotta, and Rockland. None of these towns has many service businesses. New Harbor, for example, has an area in the middle of town (it would be too much to call it a "downtown") with a moderate sized food store, a store selling groceries, gas and short order food, a hardware store, two restaurants, a bakery, and four gift shops and art galleries serving the tourist trade. Spruce Head and Cushing offer far fewer services. The exception is Boothbay Harbor, which is one of the tourist meccas and yachting centers along the Maine coast. There are four boat yards in the harbor and immediate area building a variety of different kinds of boats, a yacht club and other establishments catering to the boating trade. The harbor itself is lined with motels, restaurants and stores of various kinds catering to the summer tourists. In the summer the downtown district has throngs of people on foot and the automobile traffic creeps through town. Finding a parking place in Boothbay Harbor can be very difficult. In addition, Boothbay Harbor has a small hospital, a large Old folks home (need Name) a number of professional offices, a Coast Guard Station, the Department of Marine resources laboratory and the Bigelow Laboratory for Oceanographic Research.

In all of these communities, employment is far more varied than it is on the islands. In Boothbay Harbor, the tourist and service industries are the largest employers. In New Harbor, Cushing and Spruce Head, the lobster fishery employs more people than any other single industry in the community, but a substantial number of people are employed in service industries, or in jobs in nearby cities (e.g. Bath Iron Works the Cement Plant in Thomaston). In some of these communities, the number of lobster fishermen is far outstripped by retirees who have no job at all.

All four of these harbors have nucleated territoriality. To be sure, each of these harbors has a small area very close to the harbor mouth that they fish exclusively in the summer months. Most of the area exploited by people from these harbor gangs they fish jointly when men from one or more other harbors. In Boothbay harbor, these exclusive areas are literally in the heads of Linekin Bay, Lobster Cove and Boothbay harbor itself. The exclusive area of New Harbor is approximately 1.5 square miles of the estimated 55 square miles of territory. In spruce Head, the exclusive area is a bit larger, but not much. (Dan cheney's comment "who would we negotiate with.?)

Moreover, there efforts to limit entry have largely broken down. In the past, the vast majority of fishermen came from the town itself, and most people attempting to joint these town harbor gangs from other towns were rebuffed. Even people who move into the community from outside had a difficult time going fishing. For at least the past 20 years, the vast majority of people who live in the community, learn the local norms, and begin lobster fishing on a small scale, nthe Now, in all four harbors, a sizeable number of people either live in other towns or have moved into town from elsewhere. In Boothbay Harbor, an estimated half of the fishermen did not grow up in Boothbay Harbor; and at least a third of the men fishing from out of Boothbay harbor live in the nearby towns of Boothbay, Edgecomb or Southport. In Gushing, the situation is similar with people fishing from Pleasant Point who live in Thomaston and a few from the towns of Hope and Union, which are 20 miles away. A few people who fish from New Harbor live in bremen, and two even come from Waldoboro, which is half an hour away by car. Still, as we discussed in the last chapter, these communities are not completely open access either. In recent years, two fishermen from Augusta, who went fishing from Boothbay Harbor in a fashion that offended many local fishermen, lost so much gear that they finally decided on another line of work. The same thing has happened in virtually every harbor with nucleated fishing areas along the coast.

In all of these four harbors, the amount of interaction among fishermen is far less than it is on the islands. In these harbors fishermen know each other at least by reputation; and they all know who the "highliners" and potential trouble makers are. There is a good deal of interaction on the radio. Bothbay harbor fishemen monitor two channels: the younger men, who are more verbose tend to use channel 77; the older fishemen channel 10. But there are no meetings that all the lobster fishermen attend, and many fishermen in these harbors do not know each other well. One fisherman from Boothbay Harbor who had sereved as President of the Local cooperative, said he knew all of the lobster fishermen in Boothbay harbor who had boast over 30 feet long." "I know who they are, but I can't recall the names of all of their boats or what their colores [buoy colors], [this conspicuously leaves out the numerous men with small boats, who include virtually all of the "part-time fishermen.] When I asked him, how many of the Boothbay bothbay harbor fishermen he talked to over the course of the year, he estimated he talked to about 3/4 of them. But he admitted he did not know many of these men well or "what they were thinking.⁹". Contrast this with Monhegan Island where fishermen all meet together on numerous occasions-sometimes more than once a week— in the fish house of one of the lobstermen.

each otherknwmt. v. No meetings that all attend.e.gwho.steñ On an island, sense of community and amount of social capital is far less than it is on the islands. Help each other retrieve lost gear.

All of these harbor have a far more heterogenous fishing population than than those of the islands. Not only do the full-time fishermen fish different amounts of lobster traps, but all of these harbors have a large number of part-time fishermen with small skiffs and far smaller trap numbers.

Chapter 3

The Island Game: Informal Rules and the Factors Producing Them

Some of the island areas have been far more effective in providing rules for themselves than nucleated areas on the mainland have been. They have been effective in organizing the defense of territorial boundaries, and they have limited entry to their harbor gangs. Some of these island areas have also been able to provide trap limits for themselves. Why should this be so? What characteristics do these islands have that allow them to succeed in providing such rules? In this chapter, I will attempt to answer these questions by focusing on the circumstances that allowed fishermen on four of these islands to provide trap limits for themselves. However, some attention needs to be paid to territorial defense and limited entry, since all three problems are interconnected.

Since the mid 1950's many lobster fishermen have wanted trap limits. Legislators, responding to the wishes of their constituents put in trap limit bills, but every one was defeated. By the late 1960's and early 1970's fishermen were badly frustrated with the stalemate in the legislature. A number of groups of fishermen along various parts of the coast were talking seriously about imposing trap limits on themselves by informal means. Only five island communities succeeded in doing so: Monhegan, Swan's Island, Criehaven, Metinic, and Green Island, and these are still in effect today. Green Island, Metinic and Criehaven have provided trap limits informally by "gentleman's agreements." Monhegan and Swan's Island have had them formalized by the state of Maine. No other individual communities tried to get a trap limit except for Pine Point, which had a limit for a few years which then failed. The question this

raises is: Why have the five island communities been able to provide themselves with trap limit regulations when the vast majority of the communities in the state which have had no recourse but to go through the frustrating process of repeatedly approaching the Legislature? What do these cases tell us about a far more central issue-namely the conditions under which norms are generated?

From the point of view of most fishermen, trap limits make a good deal of sense. As the number of traps escalated, trap congestion and trap tangles increased. Those fishermen who increased the number of traps they fished had to spend more hours pulling traps, and they had to spent considerably more on traps, bait, and gasoline. Many who invested in larger amounts of gear had to buy larger boats and had to hire sternmen to tend them, which increased costs still further. Those who did not increase the numbers of traps they fished had a smaller percentage of traps on the bottom, which resulted in relatively smaller catches and lower income. The solution, in the eyes of many, was a law putting a cap on the number of traps a person could fish. A trap limit, they argued would, allow each person to catch the same number of lobsters as they would if each had a larger number of traps. It might take a few weeks longer to achieve the same catch, but they would have the same gross income and substantially smaller expenditures for traps and, bait. In addition they would have smaller boat expenses since tending a large "gang" of traps takes a bigger boat, more gasoline, and usually requires hiring a sternman. Perhaps most important, they would also have considerably fewer problems with entangled gear. As the trap escalation became increasingly worse over the course of the last fifty years, tangled gear has been a source of lost time and much aggravation.

There is some evidence that trap limits do cut costs while maintaining catch levels. In 1981, three years before Swan's Island began its trap limit, the fishermen on that island caught 3.32 percent of the state's total catch; three years after it was established, they caught 3.33 percent of the state's total catch (Maine Department of Marine Resources 1994). In these years,

there had been no change in the number of people fishing on Swan's Island, or in the number selling to the cooperative.

From a theoretical point of view, lobster fishing presents a situation in which there should be a considerable demand for rules limiting effort. As Coleman points out, "the demand for a rule will rise when an action by one actor imposes externalities on other actors" (1990: 251). Lobster fishermen impose two kinds of external costs on each other: (1) the lobsters one person catches cannot be caught by others fishing in the same area; (2) traps can become entangled, and the number of tangles increases with the number of traps in an area.

Why then has it been so difficult to get a trap limit law passed? From the point of view of the Legislature, the problem was a lack of consensus in the industry, which translated into a lack of support for any specific bill. In every harbor older fishermen generally want to fish fewer traps than younger men; full-time fishermen want to fish far more traps than part-time fishermen who have other jobs. Then the mean number of traps used per fishermen varies considerably from one part of the coast to another due to ecological differences. As a result, even though everyone would have gained from a trap limit, no law limiting the number of traps was passed until 1995. As we shall see in Chapter Five, it was not the bill that the industry wanted.

On another level, the difficulties in getting a trap limit are traceable to the fact that a trap limit poses a typical communal action dilemma. It is rational for individuals to increase the number of traps they fish, even though a rule limiting trap numbers would benefit everyone. A person with a higher percentage of traps on the bottom will catch more lobsters than someone who has a smaller percentage. Even in the face of an agreement, there is strong motivation to cheat since people who have more traps than their fellows will earn more. What this means is that the five island communities that have imposed trap limits on themselves have overcome a communal action dilemma. How have they been able to succeed?

The Islands

The islands off the coast of Maine were visited by some of the earliest explorers of the New World. Beginning in the early 17th century, the rich fishing grounds attracted Europeans who first visited these islands in the summer to dry cod for shipment to Europe. By 1750 many islands were occupied year round. The late 1880's saw approximately 1100 islands with permanent settlers, who were engaged in both farming and fishing. In the 1880's tourist hotels and cottage colonies created additional economic opportunities. Shortly after the turn of the 20th century, island populations began to fall rapidly. The mainland held many attractions. Only the largest islands had stores, schools, and post offices, and none had electricity. Everything has to be transported to an island by boat, and on many islands a supply of water is always problematic. At present, there are only eleven permanently occupied islands along the Maine coast. Lobster fishing and tourism are the mainstays of their economies. Four of these eleven have trap limits, but the institutions underlying those limits are quite different; and their trap limits have not all been equally successful by any means.

Monhegan is approximately one and one fourth miles long and is located 12 miles from the nearest point on the mainland. It has the longest and most distinguished history of any of the islands, having been visited by John Cabot in 1497 and by a number of famous explorers in the 16th century, including Verrazano, Francis Drake, and Jacques Carrier (Proper 1930). Sir Fernando Gorges established a settlement on the island in 1616 (Proper 1930: 109). It has been continuously occupied since the late 1600's. For many decades, all of the fishermen who exploit the waters around Monhegan have lived on the island.

Monhegan's fishermen are scarcely isolated rustics. The island has long had an artist colony; it has been a tourist mecca, drawing thousands of visitors every summer. In the winter,

there are only 70 or 80 people remaining. Most of these are members of fishing families.

Since the turn of the 20th century, there have been 11 or 12 boats on Monhegan, whose crews have the most unusual annual round of any on the coast. In 1907, they lobbied the Legislature for a law making it legal to fish in the waters within two miles from Monhegan only from January 1 to July 1; and from that time, they have fished for lobster only in the winter when prices are at their annual high. During the summer months they go to work in the booming tourist industry or in other fisheries, while the wardens protect their boundaries from the incursions of fishermen from the mainland.

On Monhegan, the sense of community is very striking. Literally everyone one knows every one else and their business in great detail. No one is anonymous, and no one's business remains secret for long. One fisherman was heard to remark, "My life is an open book. I hope other people find it entertaining." Interaction is facilitated by the fact that all the houses and tourist hotels are clustered around the harbor in an area about half a square mile. There is only one dock, one harbor, one store and a small restaurant. Since there are only two short gravel roads in the settled area, there are few vehicles on the island. Everyone walks. On a trip to the store and the wharf to meet the ferry boat, one can meet a sizeable percentage of the island's inhabitants. On Monhegan, it is difficult to escape the scrutiny of others

People are expected to sacrifice a good deal of time and effort for the community. Literally all of the adults take on a job to help the community or assume an office in the town government, usually without pay. The offices of zoning officer, tax assessor, fire marshal, road commissioner, and a dozen others are filled essentially by volunteers. People do not really run for these offices; the decision about who will do what is made in a less formal way. By law there are town meetings, but the real decisions are made beforehand by a process of talking things out. The only time there is a contentious town meeting, one person said, is when "people have not had time to talk things over."

On Monhegan ritual events are very important. Christmas is a very important time. The entire town meets in the church, and everyone on the island gives everyone else a present. "Trap day," the first day when fishing is allowed, brings the entire community together in joint effort. Every able bodied person helps the fishermen lug traps to the wharf and put them on the boats.

On Monhegan, gossip, slander and ostracism are usually quite successful in forcing people into line with the expectations of the community. One local fisherman said "small communities periodically create witches. I was the local witch once and I have watched two other people get the treatment." Still, on Mohegan people try to get along with others and do not make accusations against others lightly. Feuds in small communities can cause a lot of problems, especially since it is impossible to avoid contact and the inhabitants are so dependent on each other for help and essential services.

Lobstermen on Monhegan hold formal meetings of the captains to make decisions concerning fishing, and the harbor gang. These meetings are held in the fish house of one of the fishermen on the waterfront, which serves as a kind of community center for the fishermen. No one besides captains are allowed entry, and what transpires in these meetings is kept secret. Even lobstermen are excluded. It is here that issues are aired, strategy discussed, and problems ironed out. Any of the captains can call a meeting. It is in these meetings that territorial defense is coordinated, although the specifics of these decisions are kept very secret. In these meetings decisions are made democratically and a consensus generally emerges, although it can take some time and much talking.

Members of the Monhegan harbor gang expects a good deal of cooperative behavior from each other. People are expected to help other fishermen in time of need; keep skiffs off the beach everyone uses; and move traps off the wharf as quickly as possible. On occasion, when someone is sick during the start of the fishing season, fishermen will decide to postpone "trap day" for a day or two until that man is back on his feet.

The harbor gang also maintains a great deal of social control over its members. One is expected to be a "good fisherman." Anyone caught molesting another's gear or violating the state conservation laws will be severely sanctioned by other fishermen on the island. One fisherman said, "our punishment for taking short lobsters is much worse than the state's." One is also expected to do one's share in defending the island's fishing boundaries against the incursions of mainlanders.

To ensure they will become assets to the island's fishing community, a person wanting to fish on Monhegan must first serve an apprenticeship by working as a sternman for a member of the harbor gang for several years. They will be allowed to set traps only if they pass muster. Even then, a person can be rejected for failure to live up to important norms.

Social control in the harbor gang is facilitated by the fact most of the fishermen on Monhegan have not been there long, which has increased the leadership power of a few older fishermen from long established island families. Four or five of these men have had enormous influence on what happens in the island's fishing community.

On rare occasion, very direct means are used to drive unwanted fishermen from the island. In past decades, two fishermen, who had been accused of violating lobster conservation laws, were made to feel very unwelcome on Monhegan. Both were called to special "captains" meetings, and according to one person who was present, told "Pull up your gear, you are all done here." Whether these people had really violated the lobster laws or not is debated by some. There is some suspicion that they were disliked because of other personal characteristics, and that they were reported to the wardens, and even framed, as a means of getting rid of them.

For our purposes, the most important decision was the institution of a 600 trap limit in 1974. The Monhegan fishermen were persuaded to have a trap limit by one successful island fisherman who demonstrated that one could make a good living with a moderate number of traps, and who argued that the trap limit in the Canadian Maritimes had been a resounding success.

But another factor was a desire to avoid competition. One man said, "some of the older fishermen were getting a little too much competition from the younger men and they didn't like it." The trap limit reduced the ability of younger men to earn more by working more gear. There was opposition to establishing a trap limit from two fishermen with a lot of gear, but they were persuaded to try the limit after a time.

The Monhegan gang has had little problem with enforcement. A couple of fishermen said that five or six years after it was established the trap limit "kind of faded," but there were none of the kinds of public accusations and recriminations that are so dangerous to air in a small community. About 1982, all of the fishermen agreed to reinstate the limit. There have been no further defections from the norm, and a 600 trap limit remains in effect.

Monhegan islanders have imposed on themselves the strictest conservation rules in the industry. Since 1907, they have had a six month season formalized by law. They have also had the informal trap limit and an informal apprenticeship program. In 1998, in the aftermath of years of territorial disputes with Friendship fishermen, the Monhegan islanders were able to persuade the Legislature to establish a conservation zone around the island. Passage of this law was the result of the coordinated efforts of the fishermen on the island, and other island inhabitants, who spent over two months lobbying legislators in Augusta (Griffin 1998). Despite massive opposition by fishermen from the mainland, the Monhegan conservation zone law passed easily. Prominent legislators said they supported Monhegan's efforts because of the island's long history of effective conservation, and because failure to do so would reinforce fishermen who had overexploited their own inshore territory and were rapidly escalating the numbers of traps they fished. The sponsor of the bill, Sen Jill Goldthwaite, urged senators to "support the people who have doing it right way for many generations" (Kinzie 1998). The Legislature may have also been responding to the concerns of conservationists and the press, because most press coverage seemed to favor Monhegan.

The law gave Monhegan fishermen an exclusive two nautical mile zone around the island except in the southwest where it extends extends 2.5 nautical miles from the island. It also formalized the 600 trap limit, the apprenticeship program, and the limited entry program which ensures that no more than twelve fishermen can fish off the island. According to the law, an aspiring fisherman must spend 150 days on a Monhegan boat, and once they pass the apprenticeship program, they cannot go fishing in Monhegan waters until one of the 12 fishermen on the island ceases to fish (Kinzie 1998).

Criehaven is about 1.25 miles long and contains some 750 acres of land. In 1799, the island was owned by Alexander Nichols, and by 1850, there were twelve people on the island. One of these settlers, Robert Crie, soon came to dominate the life of the island. He was the largest farmer on the island with some 210 acres of farm land; by the 1870's he branched out into fish packing. He built a wharf and warehouses along the harbor where he conducted his business (McLane 1982: 37). He also divided up about five acres of land he owned along the harbor into 25 foot by 100 foot strips and gave them to his workers. This incentive was designed to keep a work force for his fish plant and help to keep the total island population large enough to maintain a post office, school and store.

Few tourists visit Criehaven. The Crie family sold only a few pieces of land and only a few cottages were ever built. Most of the land on the island has been kept in a wild state by the two families that bought the Crie estate.

By the 1920's, Criehaven began to decline. Some time before 1920 the fish packing business established by Robert Crie went out of business, and all of the fishermen turned to lobstering. In 1925, the islanders gave up township status and became a plantation. The school was closed in the mid 1930's; the store and post office were gone by the late 1940's.

Before World War II, the fishermen began to leave the island to take up residence on the

mainland. They commuted to their fishing grounds around the island; during the days they were fishing, they stayed in the small houses they maintained there. They have continued this pattern to the present. Most of these houses they bought or inherited from the original owners who had received their land from Robert Crie.

After World War II, a few returning combat veterans were determined to improve the island's fisheries. Two men from old established island families took a leadership role. In the late 1940's and early 1950's they carried on a campaign to persuade the rest of the fishermen that all would be better off if they had limited number of people allowed to fish for lobsters in the island's territory, and had a trap limit. After much discussion, it was decided that the number of fishermen would be limited to the fishermen who owned the original eleven pieces of shore property on the harbor originally deeded by Robert Crie to his workers. Only these "berth owners" would be allowed to fish in the island's territory. These berths could be sold and the new owner would not only own the land, dock and house, but also rights to fish in the island's territory.

Shortly thereafter, they also agreed on a six hundred trap limit. Consensus was helped along by the activities of one man with a pension and a huge gang of traps. One of the leaders kept pointing out that the average fisherman could not compete with a person with extra income. A trap limit, he said, would be fair to everyone and allow all to make a living. In the early 1950's the eleven Criehaven lobster fishermen instituted a rule that only 175 traps would be fished in the shallow water near the island to avoid trap congestion during shedder season.

Until very recently, the Criehaven gang has had little difficulty maintaining these rules, and their rights to the island's territory. The island's territory has been established for a long time, and as one man pointed out "everyone knows what the rules are." The fishermen held meetings twice a month to iron out problems. A couple of summer people with houses on the island did have to be persuaded from going lobster fishing. One person who bought a house

assumed that he would be allowed to go lobster fishing. A special meeting of the fishermen was held, and he was pointedly told that owning a cottage would not entitle him to go fishing. He left the island and sold the property. There have also been some incursions from nearby Matinicus, but no major "cut wars" have occurred.

However, there are signs that the solid front of the Criehaven gang may be breaking down. All of the fishermen and their families have lived in various towns on the mainland for so long that the families, at least, do not consider themselves islanders. At no time in the year do the families of Criehaven fishermen get together for any event, and they do not depend on each other at all. The fishermen themselves interact far less than their predecessors did. The bi-monthly fishermen's meetings have not been held for the past several years. By 1996, only two of the original eleven fishermen who established the "berth" system after World War II were still fishing, and most of the other "berths" had been sold to people with no connections or family ties to the island. The year round island community has not existed for several decades, and the sense of community appears to be waning rapidly.

This decline in social solidarity has resulted in an increased willingness to deviate from the rules. Some fishermen are unwilling to defend a part of the territorial lines which are being breached by men from another harbor. In addition, at least four are not abiding by the 600 trap limit. For several years they were not sanctioned severely recognized that cutting off their gear or a physical confrontation would result in a great deal of bitterness, retaliation, and an irreparable fissure in the "gang." Each person owns a berth and that gives them fishing rights. Still, the fishermen who were abiding by the trap limit were very disappointed with the inability to a maintain consensus on the trap limit, and continued to fish 600 traps. Finally, in the 2000 several men decided to sanction those who were violating the trap limit. A verbal confrontation turned violent and resulted in a fight involving a melee between two fishermen, one wielding a pitchfork and the other a gaff. The one violating the trap limit rule was convicted; but his

conviction was overturned by the State Supreme Court after he argued that he was "acting in self defense contending he was under siege by other lobster fishermen on Criehaven who felt he was violating their locally imposed rules by using too many lobster traps" (Sharp 2000).

So far, the limited entry program has remained intact, and the fishermen have been able to defend their fishing territory. Together, these institutions have made it possible to make a good living with fewer traps and avoid the aggravating tangles that have become endemic in mainland harbors. When berths on Criehaven become available, men from the crowded mainland harbors compete to get them, despite the fact that they cost in excess of \$250,000 each.

Green Island lies about six miles from the western shore of Penobscot Bay. It is an 82 acre, flat, treeless island, which was used seasonally for hay and pasture in the early 19th century. Some time after 1850 half of the island was bought by a members of the Witham family; around 1900 Edwin Witham bought the other half. The land on the island has remained in the hands of various Withams ever since, and the island's fishing territory has been the family's exclusive domain for well over 100 years (McLane 1982: 32).

Only a minimal number of people have ever lived on Green Island. In the latter part of the 19th century and first half of the 20th century, a few members of the Witham family lived on the island and fished. After 1900, they tended to live on the mainland most of the year, and inhabited the island only during the summer when they were fishing. Since the 1960's all of the family members have lived on the mainland and commuted daily to the island to fish. They continue this pattern to the present. In 2000 there are nine Withams who fish in Green Island waters. They live in Rockland, Tenant's Harbor, and other towns in Knox County. All of them moor their boats in Tenant's Harbor.

The Withams are very proud of their family and its historical connections with Green Island. Fishing is more than a way to make a living. It is a valuable heritage, and one they want

to preserve for their children. The fact that in recent years four of the sons of various fishermen have decided to enter lobster fishing and continue the family heritage is a source of some satisfaction to the older fishermen.

Those fishing around Green Island are engaged in a family fishing enterprise. They love the island and value it greatly; and they want future generations of family members to be able to enjoy it as well.. However, they do not really constitute a community. No one lives on the island year round, none of the family members cooperate in any activities on the island, nor do they maintain any improvements on the island, such as a common road or wharf. The fishermen's nuclear families, which live in various mainland towns, never meet together, nor do they have any rituals. Six family members do own camps on the island, but most of these are only occupied for a few weeks in the summer.

Moreover, interaction among the fishermen is limited. The Green Island fishermen themselves only talk, in the words of one, "when they meet on the dock in the morning" before going fishing. They do not meet on any regular basis. However, they do get together when there is an issue of some kind involving the island or fishing. In recent years, meetings have been held involving state rules, environmental regulations, and boundary incursion. But such meetings in most years are quite rare.

The Green Island fishermen have been very successful in controlling entry to their island territory. For the past several decades only members of the Witham family, who own land on the island itself, are allowed to fish in the island's waters. In some periods, when there were not enough family members fishing to use the fishing area and defend the lines, the family resorted to allowing a select few other fishermen to live on Green Island in camps in the summer and to fish off Green Island. These fishermen agreed to sell all their lobsters to a dealer in Rockland (usually Witham Brothers); the dealer would pay a set fee per pound caught, called "freight money," to the Witham family. This "freight money" was put in a special account and divided

up among all family members who owned land on the island or was used to reimburse people who lost traps in defending the island's boundaries.

For the past 50 years the number of people fishing Green Island waters has remained constant. In the mid 1950's there were nine boats fishing off the island; in 2000 there are still nine vessels.

The Withams have been very successful in defending their exclusive fishing rights to the island's traditional territory. No one fishes over the Green Island lines without coming up against a very coordinated and effective defense. The defense is buttressed by the local ideology which asserts that the people who own shore land have fishing rights in the waters adjacent to their property.¹ In their view, the island and its waters have been theirs for a long time. No one is going to take it away from them easily. When incursions occur, the family members have had little difficulty in getting enough of the fishermen to defend the boundaries. The importance of territorial rights is one thing this gang agrees on.

However, they have been less successful in maintaining their trap limit. In the early 1970's, the eight members of the Witham family fishing around Green Island decided to have a 500 trap limit. At that time there appeared to be consensus. The trap limit seemed to work well from 1972 to about 1974. Then the norm came completely unraveled within a matter of a few months. One person defected from the norm. Another discovered this fact, and rather than trying to sanction the defector, he too secretly began to fish more than 500 traps. Still another discovered the defection by observing his relatives and noting they were spending much more time at sea than tending 500 traps would warrant. He decided there was little he could do to convert the violators, and he too ordered more traps. A fourth became suspicious, and when he discovered what was happening, angrily told everyone, and then he too ordered more traps. There was never any serious attempt to punish those who violated the norm. Angry words were exchanged, but no one believed the defectors could be persuaded to obey the norm once they had

decided to break it. No one seriously proposed cutting off the offending traps; nor was there was there any question of rejecting the defectors from the Green Island territory. After all, the defectors were family members, they owned land on the island, and they are entitled to fish there. However, some bad feeling resulted from the incident. Two older fishermen, who had worked hard to persuade younger fishermen to accept the trap limit, were especially incensed.

Since the 1970's, the number of traps the Green Island fishermen use has varied considerably. After the mid 1970's, the number of traps in use grew to the point where they were they were fishing between 1200 and 1600 traps each by 1997. Since that time, they have reduced the numbers fished to avoid being in violation of the regulations of the zone they are in. In 2000 most were using 800 traps each, the maximum allowed by the zone regulations.

Swan's **Island** with some 6000 acres is the largest in our sample. The island was visited every summer by the Penobscot Indians until well into the 20th century; and it was used by European fishermen as a fish drying station in the 17th century if not before (Simpson 1960: 183; Westbrook 1958: 30-34). After the American Revolution, Massachusetts sold off chunks of Maine to entrepreneurs, with the provision that they attract settlers and develop the lands they received. Swan's Island was sold to James Swan, a friend of Washington, Henry Knox, and Lafayette, who set about attracting settlers to his proprietorship island by promising them 100 acre plots. Swan left the island in the hands of an agent; went broke; and spent many years in debtor's prison. The settlers were able to obtain legal title to the land Swan promised them, after literally decades of legal wrangling (Simpson 1960: 186; Westbrook 1958: 42-44.) Most of the permanent residents of the island are descendants of these people.

In the 19th century, agriculture and ground fishing were the mainstays of the island's economy. After 1900, lobstering became the most important fishery (Simpson 1960: 187-188; Westbrook 1958: 69-75). The last farms disappeared after World War II. On Swan's Island, the

tourist industry has never achieved the prominence it has on Monhegan. There are, however, a good number of old farms that have been bought up by "summer people," and cottages line the shore in places. In 1990, the population was listed at 348 (U.S. Bureau of the Census 1995), but in the summer there are an estimated 1800 people on the island on any given day.

There are two settlements on Swans's Island. Many of the people live in Minturn, and around Burnt Coat harbor on the south end of the island; another small cluster of houses is in Atlantic on the north side of the island. However, many people live in houses stretched along the eight miles of road on the island or down driveways in isolated parts of the island. On Swan's Island the population and services are scattered enough so that everyone owns a car. People regularly travel to the mainland to shop and obtain medical and legal services using the car ferry owned and operated by the state of Maine.

The lobster fishermen sell their catches at the cooperative and to two private dealers; a number have their own private wharfs. The largest employer on the island is Atlantic Salmon of Maine, a salmon aquaculture operation employing eight to ten people.

As in most small, isolated communities there is a good deal of interaction among the people on the island and a distinct sense of community has developed. All of the permanent residents know one another, and everyone knows what other people are doing. A couple of people have said that Swan's Island is just a "big family." In fact, most of the permanent residents are members of one of the seven extended families that settled the island. Social life on the community revolves around family get-togethers, church suppers, meetings of the Odd Fellows, suppers at the Odd Fellows hall, and baseball games. Usually a group of people will get together once a year to put on a play. Others volunteer a good deal of time to the historical society, library, or town politics.

However, on Swan's Island it is possible to lead one's own life and remain remarkably uninvolved with community events. One person said some families are quite "independent."

They are friendly enough, but mind their own business and sell their own lobsters on the mainland to make a few extra dollars. Another said "Some people just work every day, and spend what little time they have with their family watching TV. You really do not see them that much."

The ability to remain detached is facilitated by the physical layout of Swan's Island. The population is scattered, and the widespread use of cars isolates people. Moreover, there is no ethic of universal community service. Some people serve the community; other are content to let them. One person said " it is the same small group of people who take responsibility for making sure things run." One person served as a selectman for twenty five years; and he is now on the school board. Others do not serve at all.

The number of lobster fishermen has grown greatly in the past few years. Swan's Island certainly does not have a limited entry program. One knowledgeable person said there were about 50 lobster fishermen in 1980 (35 full-time); today there are 85 or 90 boats, and at least 50 of these men are full-time fishermen. A few islanders have said that "the island" waters are reserved for "natives" of Swan's Island, and most of the fishermen do come from the seven old island families, or have married into such families. But this doesn't do much to limit the number of fishermen. Virtually anyone from Swan's Island who wants to fish can do so, and a few "transplants" and "off islanders" have been successful in establishing themselves in the fishery as well. New fishermen on Swan's Island, as new fishermen in any harbor, go through a period of harassment, but there never has been a serious attempt to limit the numbers of fishermen.

However, Swan's Island has been quite successful in maintaining its traditional territory and getting a trap limit. The Swan's Island trap limit began in 1984 when the Commissioner of Marine Resources was persuaded to enact a regulation making Swan's Island a "conservation zone." That is, boundaries were agreed upon, and all those who fish within those boundaries

must fish under a certain number of traps or face prosecution. The conservation zone is administered by a committee of four local fishermen elected by the lobster license holders on the island. The number of traps permitted has varied somewhat. In 1984, the trap limit was 600; then it was lowered to 400 for a two man boat and 300 for a man fishing alone; in 2000, it is 475 for everyone.

The Swan's Island conservation zone was brought about largely by one man, Sonny Sprague, who was aided by a few other highly regarded fishermen, who had long been "sick of the crowding and never being able to find a place to set traps." In 1978, after a series of statewide trap limit bills had died in the Legislature, Sprague and a few others became determined to get a local trap limit. He spent the next four years arguing and negotiating.

Most of the island's fishermen came to favor the conservation zone and trap limit when Sprague convinced them that such a law would allow everyone to make a good living, while reducing congestion and costs. Nevertheless, a small group of determined Swan's Island fishermen fought against the plan, and they remained bitterly opposed to it years after it passed. Persuading fishermen from other nearby harbors to go along with the trap limit was more difficult since many of them perceived that they might lose fishing territory. In deference to them, the north side of Swan's Island was excluded from the conservation zone, and a provision was included in the plan allowing people from the mainland to go fishing in the zone if they are willing to abide by Swan's Island's stringent trap limit. Spencer Appolonio, the Commissioner, signed the regulation creating the zone in 1988 only after years of talking convinced him that such a law would cap fishing effort and that most of the fishermen in the region would go along with it. The conservation zone and trap limit have been in effect ever since.

There is a good deal of support for the conservation zone and trap limit on Swan's Island, In 2000, fourteen years after it was established, most fishermen agree that the conservation zone and trap limit have benefited everyone. Swan's Islanders say that a trap limit helps to limit gear

tangles, reduces bait and trap bills, and minimizes the jealousy that is so prevalent in other harbors. Their willingness to support the conservation zone is enhanced by the fact that it helps to maintain their fishing territory. There is also a feeling that the conservation zone will help conserve the lobsters resource in the long run. Sonny Sprague said that one of the major objectives of the conservation zone was to preserve the fishery for the next generation. He said, "The lobster fishery is the only thing that keeps Swan's Island alive as a year round community. If it goes, the community would die as a year round population."

The conservation zone has had two different kinds of problems. First, fishermen from the increasingly overcrowded harbors on the mainland have been placing more and more traps close to the Swan's Island lines. "We are feeling squeezed," one Swan's Island fisherman said. Second, on the island there is no universal agreement about how many traps should be used. Some people would like to fish more than the allowed 475, both to make more money and to help hold their fishing territory against the encroachments of the mainlanders. These men have been lobbying to change the number of traps to 600. Early in 2000, the administrators of the Swan's Island conservation zone held three meetings at the Odd Fellows hall to settle this matter. The proposal to change the trap limit from 475 to 600 was defeated by a vote of the fishermen.

A few fishermen have taken the law into their own hands. Some people from other harbors have been prosecuted for placing traps in Swan's Island waters; others from the island itself have been prosecuted for having more traps than they were allowed under the trap limit regulations. In the 16 years since they were passed, there have been only approximately eight court cases concerning violations of the Swan's Island conservation zone rules.

Analysis of Factors Promoting Informal Trap Limits

A complicated set of variables played a role in producing the trap limit on these islands.

Bargaining Over Distributional Issues

Knight (1992) argues that all rules and norms come about as a result of conflicts between

factions over the distribution of valuable goods and services. This insight sheds a good deal of light on the factors producing trap limits. In all cases, the trap limit was the result of a distributional battle within the harbor gangs between people with different interests. The limits were put in place by coalitions who wanted to use smaller numbers of traps to constrain those who were using more. These coalitions were led by skilled fishermen who could earn a good living using few traps; they were joined by others who, for one reason or another, could not fish large numbers of traps. One objective was to cut costs and control the increasingly troublesome gear congestion. Another goal of those with small amounts of traps was to increase the proportion of traps they had on the bottom so they would get a "fair share" of the lobsters.

On Monhegan and Criehaven, those wanting to fish more traps acquiesced with good grace. On Swans Island they did not, causing a rift in the fishing community that took years to heal. In the case of Green Island, everyone supported the move to a trap limit initially. The unraveling of the rule began when younger fishermen, who wanted to fish larger amounts of traps, defected. When it proved impossible to sanction them, the informal trap limit broke down completely. In this case, those who wanted to fish more traps ultimately forced their agenda on other gang members to the detriment of the trap limit.

But if a distribution fight is all that is required to establish a trap limit, then many harbors would have them, since those favoring some control on the number of traps are in the numerical majority in many places. Clearly more is involved.

Size

There is general agreement among rational choice theorists that it is easier for groups to generate norms and rules if they are group small. In small groups, where people know what each other are doing, it is easier to monitor each other's behavior and detect cheating; there is an increased likelihood that sanctions will be imposed on those who violate rules (Coleman 1990: 260ff, 272; Knight 1992: 176-180; Ostrom 1998:2; North 1990: 12; Taylor 1990: 244; Wade

1994: 215). In small groups each person's contribution is a larger percentage of the whole, making free riding more costly, and they have more incentive to cooperate since gross and average benefits of cooperation increase as group size decreases (Elster 1989: 33; Hardin 1982; Libecap 1989).

It is significant that Monhegan, Green Island and Criehaven are very small; each has between eight and twelve fishermen. Swan's Island, by way of contrast, with some 50 full time fishermen, is much larger, but since all the fishermen live permanently on the island, they can still monitor each other relatively closely.

Territoriality and Limits on Entry

A trap limit cannot come about in the absence of both limits on entry and territorial control. Like any rule, a trap limit can only be applied within the territory of a group willing to enforce it. A rule cannot apply generally. For this reason, trap limits cannot develop in areas where there is a lot of mixed fishing under the control of two or more gangs. Why should a person from one gang obey a local trap limit when he is fishing a few yards from someone from another gang, who has inundated an area with traps? Obeying a trap limit rule under these circumstances puts one at a disadvantage.

At the same time, it makes little sense to have a trap limit where it is possible for others to enter the harbor gang in large numbers. The objective of a trap limit is to gain the benefits of lower congestion and costs, when all members of a gang lower the number of traps they have in the water. If everyone in a harbor gang lowers the number of traps they own, while others are allowed to join the gang, the result can be more traps and more congestion, not less. For these reasons, trap limits are found only in perimeter defended areas where boundaries are well defended and substantial barriers to entry exist.

On these islands varying mechanisms are used to control access to the island's waters and defend boundaries. On Criehaven, rights to fish are obtained by purchasing a berth; on Green

Island such rights are conveyed by family membership and inheritance. On both these islands, the island's fishing territory is defended by the threat of illegal activity, which is legitimized in the eyes of the island fishermen by the fact that they have legal property rights on the island. On Monhegan entrance to the harbor gang is attained by moving on the island, serving an apprenticeship, and being judged acceptable by the established fishermen. On Swan's Island fishing rights are obtained by virtue of being a member of an established island family. On these two islands the island's fishing territory is specified in law and maintained with the help of the state's warden force.

All four islands have perimeter defended territories which give rights over ocean areas that have many of the attributes of private property (Ostrom, Gardiner and Walker 1994:) A number of analysts have stressed that property rights lower transaction costs and help secure the benefits of investments (Acheson 1994; Libecap 1989: 12-15; North 1990: 33, 52). Both Ostrom (1992: 69) and Wade (1994: 215) argue that people will not assume the costs of producing rules to manage resources in the absence of such rights.²

The importance of controlling territorial boundaries and entry to harbor gangs vastly increases the problem of generating informal trap limits since it means that a **three tiered collective action problem** is involved. Organizing a group to claim and defend a territory is one collective action problem; generating a rule to limit entry to gangs is another. The third collective action problem is involved in producing a trap limit. Solving the trap limit collective action problem depends on having solved the first two collective action dilemmas. Such multi-tiered collective action problems have been noted in the literature before (see Hechter 1990: 246). *Discount Rate and Dependence on the Resource*

Some social scientists argue that the time horizon users of resources have affects their behavior. If people value future income streams from a resource highly, they will be motivated

to maintain the resource in the long run. Such people, who have low discount rates, will be much more willing to conserve the resource for their own gain in the future or even for their children. If they discount the future highly, they want to obtain all they can from the resource as quickly as possible since future income will be small or not come at all (Ostrom 1990: 34-37, 188, 206-209; 1998: 2-4; Singleton 1998: 24). People who have a high dependence on the resource are more likely to have a low discount rate. If the resource is overexploited and destroyed, they have no way to earn a living in the future, and the community dies (Ostrom 2000a: 34).

There can be little question that people in these four perimeter defended areas are highly dependent on the lobster industry. Lobster fishing is the primary way of making a living on Monhegan, and Swan's Island. There is no other way of making a living from the investment made in Green Island and Criehaven. As expected, the people fishing in the waters of these islands place a high value on future income from the lobster industry, indicating a low discount rate. Time and again, they stressed that they were willing to make sacrifices to preserve the resource for the next generation. Repeatedly, they stressed the history of the island and the role of their family in that history. They said they wanted enough of the children to be able to earn a living on the island so that the island community would not die. They said, in one way or another, that if the resource is maintained, it will support them and their children far into the future. To be sure, limiting entry and defending territorial lines raises catches per trap, while trap limits cut costs substantially. This has an immediate and positive effect on incomes. However, a secondary motive is to conserve a resource which would support another generation, their family and community far into the future. In some part, their low discount rate relates to the fact that there are few alternative opportunities on these islands. If the resource dies, the community ceases to exist.

Community and Social Capital

Recently a number of scholars have argued that one of the most important factors allowing some groups to develop rules to solve communal action dilemmas was a sense of community and the social capital that is found in communities (Singleton 1998: 23-24; Singleton and Taylor 1992). Communities, in this sense, are small groups whose members have intense face to face interaction and multiplex ties. They have a relatively stable membership, share a set of beliefs and values, and expect to continue interacting with each other over a long time span (Singleton and Taylor 1992: 315; Agrawal and Gibson 1999: 640). In small communities, where people interact a great deal over time, they have developed common norms, networks and sentiments. This "social capital" makes it easier to obtain consensus (Coleman 1994: 190). In such communities, everyone knows the reputation of every one else; they know who to trust and who is likely to violate rules. Perhaps most important, they have reciprocal relationships with a number of other people, which increases what Singleton and Taylor call their "mutual vulnerability." That is, they are dependent on each other for a variety of things of value, which other people can withhold if they are angry or displeased. This renders people in small communities more vulnerable to sanctions. (Singleton and Taylor 1992: 315). Ostrom (1998: 3) puts much of this in a nutshell when she writes: "...reciprocity, reputation and trust can help to overcome the strong temptations of short-run self-interest." She summarizes the importance of community and social capital for developing rules to manage common pool resources by saying: "In such situations, individuals repeatedly communicate and interact with one another in a localized physical setting. Thus it is possible that they can learn whom to trust, what effects their actions will have on each other and on the CPR, and how to organize themselves to gain benefits and avoid harm. When individuals have lived in such situations for a substantial time and have developed shared norms and patterns of reciprocity, they possess social capital with which they can build institutional arrangement for resolving CPR dilemmas" (Ostrom 1990: 183-84)

The existence of a community itself will not guarantee that rules can be generated to

solve communal action dilemmas. Rather, such communities have characteristics that make the negotiations to get norms less costly, and hence increase the probability that such rules will be provided. Taylor and Singleton (1993: 196) argue that the existence of community makes it easier to overcome the transaction costs that are incurred in developing norms, while Ostrom (2000a: 45) says that rules are more likely to be developed by groups if the benefits are larger than the costs.

Implicit in this analysis is the idea that rules or norms result from a number of variables working in tandem. No single variable alone will result in the production of norms. A number of other people who have attempted to understand the conditions under which groups are able to generate rules have come to a similar conclusion, including Ostrom (1990: 90; 1999; 2000b: 138), Pinkerton and Weinstein (1995: 178ff), and Wade (1994: 215-16). Although there are a number of common elements in these lists, there are a number of important differences as well. Whether it will be possible to someday develop a list of factors that everyone agrees are responsible for the generation of rules is debatable. What we agree on is the idea that the generation of rules is very complicated, and that the problem cannot be reduced to a simple elegant solution.

Political Entrepreneurs

In all four cases, **political entrepreneurs** played a critical role in generating these local trap limits. Highly successful fishermen worked for months or even years to persuade fellow fishermen in their own harbor gangs and others that a trap limit would be advantageous. They succeeded, at least with the people who were fishing or wanted to fish moderate sized gangs of gear. As do all political entrepreneurs, these people did more than work for the public good; they also offered information, expertise, and resources (Taylor 1990: 233-234). More important, they changed people's beliefs about trap limits.

Summary: Harbors With and Without trap Limits

Informal trap limits are the result of a rare set of conditions that are found on only four islands. I argue they came about where political entrepreneurs were able to mobilize an effective following within a harbor gang to win a distributional conflict against those who wanted to fish large gangs of gear. It was worthwhile to accept the transaction costs involved in this contest where the gang has a lot of exclusive fishing area, where entry into the harbor gang is strictly limited, and where the discount rate is low. Small gang size, social capital, and a sense of "community" aided in gaining consensus and keeping people from defecting from the norm.

Virtually none of the other harbors along the coast have harbor gangs with the characteristics necessary to produce trap limits informally. In many harbors, those wanting to fish small or moderate amounts of gear have been effectively opposed by those wanting to fish more. Even on some of the islands with perimeter defended areas, attempts to get trap limits informally are stymied by powerful coalitions of men wanting to fish a lot of gear. A resident of one such island, who requested anonymity, said: "the ones that could have helped [i.e. impose a trap limit] are the biggest pigs in the bay." There are islands which have all of the characteristics that would support the institution of an informal trap limit except for political control by a group wanting such a limit. On these islands, nothing happened. This reinforces the idea that a distribution fight and control by factions in favor of trap limits is the key variable in producing informal trap limits.

More important, in mainland harbors with many part-time fishermen, the full-time fishermen have little incentive to have trap limits since their response to an increasing part-time population has been to put more gear in the water to maintain catch levels.³ In the words of fisherman Arthur Pierce, when the "part-timers come in, the full-timers build up their gangs to keep ahead—to maintain a lead in the competition for lobsters. If you have a string of traps and the part-timers move in, your string will catch a lower number of pounds of lobster per trap. To

make a living, you have to increase the number of traps you fish." The influx of part-time fishermen—especially in the western part of the coast—has resulted in massive trap escalation, with full-time fishermen commonly having more than 1800 traps prior to the recent imposition of the state-wide 1200 trap limit. Casco Bay, where much of this escalation has occurred, has become known facetiously as the "Bay of Pigs." Here, virtually all full-time fishermen have opposed trap limits because such rules work to the benefit of their competition, the part-timers, by increasing the percentage of traps they have on the bottom.

Moreover, none of the harbors on the mainland have perimeter defended areas. The existence of nucleated territoriality in one of these areas means that imposing a trap limit would find members of the gang imposing the trap limit competing with people who are not constrained by such a rule. The alternative would be to organize two or more adjacent gangs to get a trap limit. The transaction costs of such an attempt would be enormous.

The large size of mainland harbor gangs, along with weak community ties, exacerbates the problem of getting trap limits. In the large harbor gangs on the mainland, there is less capacity to come to consensus and sanction violators of norms.

It may be possible to generate self imposed ("decentralized") trap limits on the mainland, but clearly the transaction costs of doing so would be much higher. Only one mainland harbor has succeeded, and their trap limit rule did not last long . Palmer (1994: 246) reports that this rule lasted for only a few years before it broke down.

Three Communal Action Dilemmas

Four Perimeter defended islands have been able to provide several different kinds of rules for themselves: trap limits, territorial rules, and limited entry rules. All of these are communal action dilemmas. In all cases, there is a strong motive for people to defect from the norm.

Are there factors that have been instrumental in allowing these islands to produce and maintain all three kinds of rules or rules in general? Are the factors responsible for the

production of trap limits the same as those allowing these communities to generate rules concerning limited entry and territorial defense? In answering these questions, it needs to be noted that the factors responsible for generating these rules are not the same as those maintaining them.

There is no doubt that distributional concerns are the primary motive behind establishing the trap limit, and that these rules were established by negotiations orchestrated by political entrepreneurs. There would be little sense in establishing trap limits in the absence of territorial boundaries and limited entry. These institutions stop the benefits of trap limits from being captured by fishermen from other harbors.

Although we have little information on the motives of those establishing territories and limited entry rules in the 19th century, it is very likely that distributional concerns played a strong role. After all, both territorial defense and limited entry rules are ways of increasing catches for a group of fishermen in a particular location. However, in interviews concerning territorial defense and limited entry, two additional factors came to the fore, namely a low discount rate and dependence on the resource. People made it plain that there were few if any other ways to make a living on these islands, that they needed to preserve these resources for themselves if they were to make a living, and for future generations if the community was to survive. I suspect these factors played a strong role in motivating the establishment of territories and limited entry rules.

What maintains these rules once they are established? A clue is contained in the fact that not all of the harbors have been equally successful in maintaining these three types of rules. Swan's Island has been able to maintain its trap limit and traditional territory by lobbying the Department of Marine Resources to establish a conservation zone. It has not been able to limit entry into the harbor gang, and there is not universal compliance with the trap limit regulations. Green Island has done a good job of territorial defense and limiting entry. However, its trap limit broke down completely after a few years. Criehaven has limited entry to the eleven people who

own berths, but this gang has experienced some defections from the trap limit rule and some members have clearly been free riding on the willingness of others to defend the traditional territory. Of all of the islands, only Monhegan has been able to limit entry, maintain territorial defense, and maintain its trap limit. What is it about Monhegan that has allowed it to be more successful in solving its communal action dilemmas than the other islands?

Monhegan has succeeded in maintaining all three rules because of its very strong sense of community. It is a small year round community where intense interaction aids in developing common goals and values, allowing people to reach consensus more easily. The ability to sanction defectors is enhanced by the ease with the behavior of others can be monitored and their high degree of dependence on other islanders, making them "mutually vulnerable."

Swan's Island, by way of contrast, is also a year round community. But it has a larger, more spread out population, and much less interaction between inhabitants. Its fishing community has developed factions, and some people are defecting from the trap limit norms.

Green Island and Criehaven have little sense of community, the fishermen and their families do not interact much, and they have not developed much social capital. The ability to sanction defectors is undermined by several factors. The fishermen and their families all live on the mainland, adding to the cost of monitoring each other's behavior, and making them less dependent on each other. Moreover, the idea that only those who own land have the right to fish off these islands makes it very difficult to sanction island fishermen who violate rules. After all, they own land or berths on the island and have a right to fish there. This ideological commitment, however, does reinforce the local limited entry rules.

If this analysis is correct, two factors play a key role in establishing rules: distributional concerns motivate people to want rules, and political entrepreneurs are the means by which they are negotiated. A strong sense of community appears to play a key role in maintaining rules once they are in place.

NOTES

1. According to Maine law, ocean is owned by the government, but as we have described all groups of lobster fishermen have territories. Moreover, in Penobscot Bay, local custom upholds the rights of landowners to fishing rights in waters near their property; here, there are instances in which people have purchased islands to gain the right to fish in the waters nearby.
2. Recently there has been a considerable divergence of opinion on the importance of property rights in ensuring cooperation solutions. Taylor (1990: 236-238) strongly argues that property rights are not necessary to solve collective action problems. Ostrom (1992: 69) argues that "clearly defined boundaries" are necessary if institutions to manage irrigation systems are to be developed, which of course involves solving a collective action problem. Ostrom's position reflects that of the common property theorists in general (see Acheson 1989a). The data on the trap limit in the Maine lobster industry reinforces the case she is making concerning the importance of boundaries and property rights.
3. Although fishermen speak of "full-time fishermen" and "part-timers," it is very difficult to accurately define a "full-time" fishermen. Very few fishermen exploit only lobster throughout the year and have no other source of income. What "full-time" generally means is that lobstering is the most important source of income.

WORKSHOP IN POLITICAL THEORY
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Bibliography checked 11-17-00

Corrected by Ann 11/17/00. Bib corrected 4/24/01.

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Chapter 4

The Genesis of State Laws for the Lobster Industry

The process by which laws were developed for the Maine lobster fishery is an anathema to professional fisheries managers. Fisheries biologists firmly believe that science and scientists should have a lead role in developing regulations, and that "special interests" should be kept at bay (Rosen 1995).¹ In the Maine lobster industry, regulations were not the result of cool, detached debate in which the best scientific evidence was formulated into law. They came about as a result of a political process in which the fishing industry, state agencies, dealers, the Legislature and later the Federal government and conservation groups played a role. The process was marked by heavy lobbying pressure, primarily, but not exclusively, by various industry factions. The negotiations and political maneuvers between these interested players were often decidedly unfriendly and acrimonious.

In the debate and maneuvering that took place, genuine concern for the welfare of the resource was mixed with brazen self interest. If people in the industry were concerned with conservation, they were often concerned that the resource be conserved for themselves. The bureaucrats were concerned about improving conservation efforts for the lobster resource when this did not result in undue political opposition or take too much effort. The Maine Legislature, for its part, usually remained above the fray until the votes were counted. Periodically, however, it would act with unusual courage in the public good.

These laws were put into place over the course of the past 120 years by political processes

which do not fit neatly into any one theoretical mold. Complicating the picture are the complex and changing roles played by factions in the lobster industry, the bureaucracy, and the Maine Legislature.

The state statues governing the lobster industry came about during three periods spanning the past 120 years. The first of these was the 1870's and 1880's when the first conservation laws were enacted. The second was the early 1930's when the double gauge law was enacted. The third is the current period, from 1977 to the present. During this period, the Maine Legislature passed the escape vent law; in 1995, it enacted the zone management law, which radically changed many aspects of governance of the industry. In 1977 the Federal government had gained the power to regulate fisheries and this strongly influenced the legislation-even state laws-passed in this period.

In each of these three periods, the issues, the players and environment were quite different. All had an important influence on the legislation that emerged. The state of the lobster stocks and the size of catches had a major effect on the legislation that was passed. Catches were relatively high in the 1880's, although they had been much higher previously (see Figure 1). Catches languished in the early years of the 20th century and then declined disastrously in the years between World War I and World War II. Since World War II, catches have been very stable, save for the past 12 years when they have increased to record high levels.

Growth of the Conservation Ethic

A major factor influencing legislation has been attitudes toward conservation in the industry and the public. In the late 19th and early 20th centuries there was massive violation of the then existing conservation laws. Throughout the early decades of the 20th century, it was

common for people to take home short lobsters to feed the family. A very large number of fishermen and dealers were involved in the lively and remunerative "short lobster" trade, whereby untold amounts of illegal-sized lobsters were shipped out of state (Judd 1988: 612). Zenas Howe, the Massachusetts Fisheries Commissioner, reported that illegal lobsters from Maine were arriving in Boston by the boatload in the 1930's (Correspondence of the Commissioner 1931e). In addition, it was not unheard of for fishermen to smash up short lobsters caught in their traps to serve as bait (Clifford, 1961: 124). Even worse, many scrubbed the eggs off berried females and sold them, resulting in what Rathbun called a "wholesale slaughter of females with eggs" (1887: 697).

In the early 1920's violations of the lobster conservation laws were so severe that Commissioner Crie closed the entire lobster fishery along the central coast for a period, convinced that only drastic action would change attitudes and practices (Clifford, 1961: 204; Martin and Lipfert, 1985: 55). This closure may have played a role in changing attitudes somewhat. However, in the early years of the century, people in the industry did not consider violation of laws as very serious offense. A conspiracy of silence surrounded the illegal lobster trade (Correspondence of the Commissioner, 1932a). Fishermen considered it "alright to save shorts to eat" and large numbers did so regularly (Correspondence of the Commissioner, 1931b). Sometimes when people were convicted of taking "shorts," judges allowed them to retain their licenses (Correspondence of the Commissioner, 1932b). Biologist Leslie Scattergood, who went to work at the Boothbay Harbor laboratory of the Department of Marine Resources in 1939, said that in the 1920's and early 1930's "violation of the lobster laws was like rum running. It was against the law, but everyone was doing it" (1996). Even in the fishery agencies, conservation

wasn't taken very seriously. Les Scattergood tells of being invited to the house of the commissioner of the state agency charged with managing marine resources in a mid Atlantic state where the commissioner's wife served her guests illegal-sized lobsters.

The period between 1930 and 1960 saw a marked change in attitudes towards conservation. By the end of the 1930's, Leslie Scattergood reports, "large scale violations had ceased." The change in attitudes and practices was brought about by the disaster of the 1930's as much as anything. Increasingly people became convinced that those violating the conservation laws were doing far more damage than they had thought previously.

In the years since World War II, a marked conservation ethic has grown in the industry. People caught scrubbing the eggs off female lobsters or taking shorts or oversize lobsters are severely sanctioned by other fishermen. "Outlaws" are not only reported to the wardens; some have been driven out of business by other fishermen (Acheson 1988: 65-67). Doug Boynton from Monhegan notes that "our punishment [for violating the conservation laws] is far worse than the state's." In the 1990's, the lobster conservation laws became almost self enforcing. Moreover, the leadership of the industry associations are very much concerned with conservation legislation. They spend a major part of their time working to get legislation that will benefit the resource and lobster industry in the long run. In short, the last 70 years has seen the industry go from a time when illegal activity was well accepted to a time when the industry is a strong supporter of effective conservation legislation (Clifford 1974: 146).

Minimum Size Limit and Protection of Egged Females: 1870s and 1880s

Until the middle of the 19th century lobsters were caught for local consumption, but no commercial lobster industry existed (Martin and Lipfert 1985:9-11). The commercial

development of the industry had to await two technical developments in the 1840s: the invention of the lobster smack, a sailing vessel with a circulating seawater tank, allowing shipment of live lobsters to the cities along the north Atlantic coast, and the invention of canning (Cobb 1901:243-44; Martin and Lipfert 1985:13).

After 1840, the commercial lobster industry expanded rapidly. Untold millions of live lobsters were shipped to destinations such as Boston and New York. The first lobster cannery was established in 1842, and by 1880 there were 23 plants in Maine packing lobster (Rathbun 1887:690). In this period, the vast majority of lobsters caught were canned.

In the 1840s and 1850s, lobsters were plentiful and the size was very large (Martin and Lipfert 1985: 43). However, by the late 1860s there were clear signs of trouble. The catch was the same, but the numbers of fishermen and traps had increased markedly, resulting in a clear reduction in both the average size of lobsters caught and the catch per unit of effort (Cobb 1901:244, 255-56; Herrick 1911:367-69; Rathbun 1887:701-08). After 1880, catches declined to the point where the operation of some of the canneries had to be curtailed early in the season for a lack of lobsters to pack (Cobb 1901:256).

Everyone concerned with the industry agreed that something should be done to protect the resource, but the solutions proposed by the canners and live lobster industry differed significantly (Rathbun 1887:725).

The fishermen and dealers engaged in the live lobster trade blamed the canners. There can be no denying that canning was very wasteful. Canners made a practice of transporting lobsters in "dry smacks," which killed a lot of the catch (Cobb 1901:250). It took about five pounds of raw lobster to get one pound for packing. Moreover, although the canneries took all

size lobsters, they preferred small ones, because they could be had at a cheaper price per pound (Mattocks n.d.). Several reports indicate that canners regularly processed lobsters weighing as little as half a pound or less (Cobb 1901:256; Martin and Lipfert 1985:42).² Such practices were detrimental to the live lobster industry. Since the stock-in-trade of the fresh lobster dealers and fishermen were large "dinner" sized lobsters destined for restaurants in the large cities of the east coast, it was in the interests of this part of the industry to protect small lobsters until they grew to a size where they could be sold on the "live market."

Thus, the battle lines were drawn between the canners and the live lobster industry. The laws that ultimately emerged were the result of a 20 year struggle for control of the resource. Much of the ammunition for that battle was supplied by European lobster biologists, who recommended that the problems in the lobster industries of their own countries could be cured with various types of regulations on size, season, and protection of breeding stock (Rathbun 1887:711-25).

Interestingly enough, it was the canners who lobbied the Maine Legislature for the first "conservation laws," to defend their interests (Judd 1988: 605). In 1872 a law was passed forbidding the taking of berried (i.e.,egg-bearing) females (Legislative Documents 1872). In 1874, they lobbied the legislature again, with the result that fishing for lobsters less than ten and one half inches (head to tail) was prohibited from October 1 to April 1 (Laws of Maine 1874). These so called "conservation" laws were designed to curtail the activity of the fresh lobster industry, but did little to change the practices of the canneries. The law prohibiting the capture of egged females did not affect the canners since they used lobster too small to extrude eggs; while the seasonal size minimum left the canneries free to take all sizes of lobsters during the summer

canning season, and made the state responsible for protecting the lobsters when the canneries were processing vegetables. Not too surprisingly, the devastation to the resource continued.

The canners may have won the first battle, but they were to lose the war. After 1870, the live lobster trade expanded enormously because of the market expansion facilitated by arrival of the railroads, which allowed long-distance shipment of iced lobsters, and the development of the lobster pound (a fenced-in portion of the ocean) where live lobsters could be stored for months. As increasing numbers of fishermen supplied the live market, their dependence on the canneries decreased, especially in the western part of the coast where access to rail service was better. The political power of those involved in the fresh lobster market grew correspondingly.

Those in the live lobster trade knew that the existing legislation worked to the benefit of the canners and did nothing for conservation. They wanted a law prohibiting the canneries from slaughtering millions of small animals, so that the lobsters could grow to a size at which they could be sold in the live trade. One fisherman called the existing laws a "farce," and called for a "law to protect the small and soft lobsters the entire year" (Rathbun 1887:727). Many echoed his sentiments, and the Legislature was soon besieged with requests and petitions from fishermen's groups for legislation to protect small lobsters.

In 1879, it was made illegal to can lobsters from August 1 to April 1 (Laws of Maine 1879). In 1883 it was made illegal to catch any female lobster "in spawn or with eggs attached, or any young lobster less than nine inches in length" between April 1 and August 1 (Laws of Maine 1883). These pieces of legislation changed the distribution of the lobster catch considerably, since they made it illegal to take the small and cheap lobsters on which the canners depended, effectively reserving the lion's share of the catch for the live lobster industry.

The canners and the fishermen along the eastern coast, who sold to the canneries, fought back. They opposed the minimum size measure and repeatedly petitioned the Legislature to allow canning to continue unencumbered. Their propaganda claimed that it was the pounds, not canning, that were causing the depletion of the resource.³

The live lobster industry continued its assault unabated. In 1885 its lobbying efforts resulted in a law effectively reducing the canning season to three and one half months (Laws of Maine 1885); and in 1889 the law was changed to make it legal to take lobsters as small as nine inches in total length only from May 1 to July 1 (Laws of Maine 1889). These laws made canning so unprofitable that the canneries began to close (Cobb 1901:256-57). Many went to Canada. In 1895, the Legislature passed a law increasing the minimum legal size to ten and one half inches at all times of year; this law apparently forced the last of the canneries from the state (McFarland 1911:233; Judd 1988:606).

Although both canners and the fresh lobster industry lobbied for legislation to reserve much of the catch for themselves, the rules they put in place were designed to protect juvenile lobsters and egg-bearing females. To this day, efforts to conserve the lobster still depend on size regulations and protection of the breeding stock.

The Export Ban and Seasonal Laws: 1900 to 1925

In the first two decades of the new century, little was done on the legislative front. During these years, the industry did engage in lobbying for two kinds of bills. Neither lasted.

Fishermen in a large number of coastal towns petitioned the Legislature for closed seasons on lobsters in the waters where they fished. The first such law closed Pigeon Hill Bay in Milbridge and Steuben to fishing in the summer (Laws of Maine 1899). Similar laws were

enacted in other towns. In 1907, Monhegan Island successfully lobbied for a law to close fishing within two miles of the island from June to November (Laws of Maine 1907b). In 1911, fishermen from Winter Harbor got the Legislature to enact a law making it illegal to catch lobsters in the waters of Winter Harbor in the summer (Laws of Maine 1911); and in 1915 similar legislation was passed establishing closed seasons in Cutler, Trescott, Lubec, Jonesboro, Roque Bluffs, and Machias Bay (Laws of Maine 1915a, 1915b, 1915c). A few years later, such laws were passed for Criehaven, and Petit Manan Point (Laws of Maine 1925, 1931). By the late 1930's and 1940's the fad had passed and most of these laws were repealed.

We know very little about the reasons these laws were passed or why they were repealed. The surviving legislative record reveals little about the rationale for such laws. In one or two cases, it was mentioned that the goal was to protect the lobsters in the summer months when they were molting. However, it is very likely that those advocating such rules had other, more practical, motives in mind. The only one of these laws that has survived to the present is the Monhegan season law. If we can judge from this law, the goal was to preserve the lobsters for a particular group of people to take at a time convenient for them. This law effectively keeps mainland fishermen from exploiting the lobsters around Monhegan in the height of the summer season when Monheganers are occupied with the tourist trade, and allows Monhegan fishermen to take them in the winter when prices are highest and there is no other source of income available. It is very likely that similar motives prompted the passage of other season laws in other towns.

John Olson of Gushing, who began lobster fishing in 1934 when he was 12 years old, recalls conversations with older fishermen on this issue. He believes these laws were designed

to raise income to fishermen and shippers by lowering mortality rates. At this time, lobsters were transported to market in smacks with flowing sea water tanks. In the summer, there would be a high mortality rate on shedders and soft shelled lobsters transported in this way. The law against taking lobsters in the summer months conserved the catch until the fall when they could be shipped with much less loss of life. When refrigeration was widely adopted in the late 1930's and 1940's the mortality due to shipping dropped dramatically, and there was no need for these laws.

Another legislative initiative in these years was the move to prohibit the export of live Maine lobsters, fueled in part by a fear of "trusts" (i.e. corporations) who were suspected of planning to hijack most of the supply, and the interests of Maine's growing tourist and hotel trade, whose well advertised outdoor lobster "bakes" depended on a supply of cheap lobsters. The lobster dealers opposed the ban since they depended on out of state markets for much of their income-especially in the cold months of the years when tourists were scarce and the hotels were closed. Their allies were the fishermen from eastern Maine, where the tourist trade was undeveloped. Together they managed to defeat the export ban in the Legislature (Judd 1988: 614-616.)

In retrospect, neither the efforts to establish town closed seasonal laws nor the export ban had any lasting impact on the industry. However, they call attention to the willingness and ability of groups of fishermen in certain towns, to lobby effectively for legislation they believe will conserve the lobsters and for legislation furthering their own economic interests.

The Double Gauge: 1915 to 1933

The end of canning and the passage of these first size laws and season laws did not see an

improvement in the prospects of the lobster industry. Catches continued to decline. From 1900 to 1920, the average catch was 13.2 million pounds, close to half of what it had been in 1889 (Maine Department of Marine Resources 1995). Both fishermen and biologists recognized that the industry was not what it had once been (Cobb 1901:241; Rathbun 1887:707). The consensus among biologists was that additional regulations were needed, over and above the ten and one half inch minimum size limit and the prohibition against catching gravid females which had been passed in the 1880's (Kelly 1990: 3). As early as 1910, biologist George Field argued that catches would not begin to rise until the larger, more prolific breeding stock was protected (Martin and Lipfert 1985:51). However, most people in the industry were strongly opposed to raising the minimum size, seeing clearly that such an increase would cut their catches by increasing the number of lobsters that had to be thrown back, and would produce large lobsters that would have to be sold at such high prices that Maine would be effectively closed out of much of the national and international markets. In retrospect, it is hard to argue with the reasoning of either side.

Francis Herrick proposed a compromise solution, namely, a double gauge law specifying both a minimum size to protect small lobsters and a maximum size to protect larger, proven breeding stock. This would focus all fishing on lobsters that were large enough to make a good meal (i.e., dinner-sized lobsters), but were small enough so that they could not usually extrude eggs. Herrick originally thought the minimum should be nine inches and the maximum eleven inches (Herrick 1911:382).

Lack of consensus resulted in the Legislature doing little beyond changing the way lobsters were measured, thereby retaining in effect the ten and one half inch minimum gauge.

(Lobsters were to be measured on the carapace rather than in terms of total length. Thus a ten and one half inch lobster [total length] became a four and three quarters inch lobsters [carapace measured from the tip of the rostrum to the end of the body][Laws of Maine 1907]. This is a 3.65 CL lobster measured from the eye orbit to the back of the shell.) For many, this was the worst of all possible worlds. Fishermen had dubbed the ten and one half inch measure the "poverty gauge," since it outlawed the vast majority of the lobsters they caught (Acheson 1992:155). They agitated against this law continually. The biologists were openly contemptuous, since this law put all the fishing effort on the large reproductive-size lobsters. Biologist Francis Herrick minced no words. He said the law was "unscientific," "defective" (1911:369), and "bound to fail" (1911:371). The disrespect with which this law was held almost certainly exacerbated the problem of enforcement. Fishermen, after all, are not prone to obey laws they consider ineffective and counterproductive.

In 1915 conditions in the industry were serious enough that the legislature appointed a commission to study lobster regulation (Legislative Record 1915a). Dr. Francis Herrick was called to testify, and strongly urged the commission to recommend a double gauge law for the long run welfare of the industry and the state (Legislative Record 1915b; Martin and Lipfert 1985:55). The commission recommended passage of the double gauge, but after representatives from coastal counties talked with their constituents, no bill favoring the double gauge was sent to the floor of the Legislature (Legislative Record 1915c).

The basic cause of the impasse was a conflict of interest between industry factions. In general, fishermen from the western counties wanted to lower the minimum size from four and three quarters inches on the backshell (ten and one half inches total body length) to nine inches

total body length. They found allies among dealers and hoteliers who wanted to increase their share of the national markets, where small or "chicken" lobsters from Massachusetts and Canada had proven all too popular. However, most of the fishermen along the central and eastern parts of the coast did not favor a small gauge, since they believed it was nothing more than a ploy by the dealers to import large amounts of small Canadian lobsters and undercut the price received by Maine fishermen (Correspondence of the Commissioner 1933a). They couched their case in terms of conserving the reproductive stock.⁴ It was to take a disaster to break the impasse.

In 1919 catches declined sharply, and they remained at record low levels throughout the 1920's and well into the 1930's.⁵ Once the Depression began, prices for lobster fell drastically, even though catches were also very low. The incomes of fishermen were so low that thirty-two percent left the industry between 1928 and 1932 (Acheson 1992:157-160; Correspondence of the Commissioner 1933b; Maine Department of Marine Resources 1995). The disastrous conditions continued for years (Correspondence of the Commissioner 1931a; 1931b; 1931c; 1933c). The fishery was not to recover until World War II.

Horatio Crie, who was the Commissioner of Sea and Shore Fisheries and a very able politician, played a key role in all of the attempts to alleviate the situation. *First, a popular idea at the time was that many of the woes of the industry were caused by a flood of Canadian imports that depressed prices. Crie attacked the problem by urging the people of Maine eat "lobsters twice a week" to strengthen demand (Correspondence of the Commissioner 1931d).* He and Senator William White strongly supported a bill in the U.S. Congress which would have prohibited the importation of "cheap" Canadian lobsters (Correspondence of the Commissioner 1933b; Elden 1931). President Roosevelt refused to support this effort on the grounds that the

Canadians might retaliate by imposing tariffs on the importation of U.S. goods and products. The Congress did not pass these bills. In addition, Crie and industry leaders attempted to get higher prices for lobsters by initiating an advertising campaign, and by introducing three bills in the U.S. Congress levying tariffs on imported Canadian lobsters (Correspondence of the Commissioner 1931d; 1933d; 1933e). This did little for sales. When it became obvious that these efforts had failed, Crie and his ally in the legislature, Senator Look, turned their attention to passing a double gauge law (Correspondence of the Commissioner 1933f). Crie pointed out that the double gauge law would protect small lobsters, conserve the large reproductive-size lobsters, and allow Maine fishermen to catch smaller, more marketable lobsters than the current law allowed. It would also, he argued, keep out forty percent of the Canadian lobsters that were currently flooding the U.S. market (Elton 1933a). In short, Crie argued that the double gauge law would be good for both conservation and sales.

In 1933 Crie began a whirlwind campaign to rally support for the double gauge law. He announced his support in all the coastal newspapers; he sent letters explaining his position to fishermen and the congressional delegation (Correspondence of the Commissioner 1933f, 1933g); and he had his wardens try to get fishermen to sign petitions favoring the double gauge (Correspondence of the Commissioner 1933h).

But no consensus emerged. A questionnaire that Crie sent to all lobster license holders revealed that the industry was badly split on the issue (Elton 1933b). Judd (1988:622) reports that "1,166 respondents favored the double-gauge law, and 1,068 were satisfied with the existing limit." Most of the support came from the western coast; most of the opposition from the east (Acheson 1997:12).

The debate became nastier, and the correspondence reveals a good deal of bitterness and frustration on all sides (Correspondence of the Commissioner 1933h). In the regular session of the Legislature, efforts to reduce the legal minimum size to nine inches (overall) and to establish a double gauge law were both voted down (Elton 1933a:8).

In December, 1933, the Maine Legislature met in special session to deal with a number of issues concerning the deepening economic crisis. Another double gauge bill was proposed as the solution to the lobster industry's problems. On December 11, 1933, Commissioner Crie spoke in favor of the bill, emphasizing the need to preserve the industry by protecting the large, reproductive animals. He promised "if a double gauge measure is passed . . . that you will see the lobsters continue to increase from year to year and no one will ever have to feel disturbed about the depletion of the lobsters on the Maine Coast so long as a double gauge measure is enforced" (Crie 1933:2).

A few days later, with almost no publicity or debate, the Maine Legislature narrowly passed the bill (Elton 1934). It provided for a three and one sixteenth inch minimum and four and one half inch maximum carapace measure. It was truly a radical piece of legislation, one of the few double gauge laws in the world (Legislative Document 1935),⁶ and it remains the backbone of lobster conservation efforts in Maine to this day.

Reaction in the industry was decidedly mixed. Some groups went on record as favoring the law (*Portland Sunday Telegram* 1933). The opponents were so unhappy that they decided to try to have it overturned by a referendum, but did not obtain enough signatures to have it put on the ballot (Correspondence of the Commissioner 1934). The opponents of this law remained bitter for decades, convinced the Crie had sold out their interests to the dealers.

Economic conditions played a role in the passage of this legislation. The industry and Legislature were more willing to consider radical solutions after years of economic decline. However, the bill would likely not have passed into law were it not for Crie's political entrepreneurship. His open advocacy of the bill, his enlisting of support from key legislators, and his speech to the legislature before the final vote were all crucial. Most important were his lobbying efforts with the industry. In the last analysis, the double gauge law passed because of a coalition between the proponents of the bill in the industry, Commissioner Crie, and powerful members of the Maine Legislature, such as Senator Look, who were concerned with marine resources. When this coalition went into action in 1931, twenty years of gridlock gave way in less than eighteen months. In essence, Crie and Look had negotiated a deal in which they gave their support to an industry faction favoring a smaller minimum size limit to increase markets, in exchange for that faction's support of a maximum size measure protecting the more prolific large lobsters.

The V-Notch Program: 1917,1948 and Building

The current V-notch law states that lobsters with a V shaped notch cut into one of eh side flippers may not be taken. Fishermen take advantage of this law by cutting V-notches in the egg bearing females they catch to prevent them from being taken by other fishermen once their eggs have dropped off They are considered proven breeding stock.⁷ Many lobster fishermen consider this the most important conservation measure in force today. In their view, it has resulted in a very large brood stock, which ensures an adequate number of eggs in the water. It has tremendous support in the industry at present. However, it is important to realize that the V-notch program is voluntary. The law prohibits fishermen from taking berried females, but there

is no law that makes it mandatory for them to cut a notch in the tail. Large number of fishermen do so to preserve the breeding stock.

The V-notch program builds on a law that was designed to subsidize pound owners. By the World War I era, there was a general consensus that the preservation of the industry depended on protection of the breeding stock, and that additional conservation laws were needed to accomplish this task. While the Legislature refused to pass the double gauge law in the 1915 and 1917 legislatures, it was persuaded to compensate by establishing a program whereby egged lobsters would be purchased by the state, whose officers would punch a hole in their tails and release them (Legislative Record 1917). Fishermen were forbidden to take lobsters with punched tails (Kelly 1990:3); and they were not allowed to sell the berried lobsters they caught to the state. Only pound owners could do so (Maine Commission of Sea and Shore Fisheries 1926:16). Biologist Leslie Scattergood said in an interview, "this law was passed primarily to stop pound owners from scrubbing the eggs from lobsters that had extruded eggs while they were in the pounds." [Pound owners had bought these lobsters from fishermen and felt that they had a right to sell them, even though it was illegal to do so once they had extruded eggs. The "punched-tail" law or "seeder program" was an effort to bribe pound owners to obey the law.] By the mid 1930s, however, the "seeder program" had expanded to the point where the state of Maine was purchasing "60,000 pounds of seed lobster, from the fishermen through dealers, at market prices" (Maine Department of Sea and Shore Fisheries 1936:11). These lobsters were punched and most were released where the warden had purchased them, but others were used in the hatchery at Boothbay Harbor.

There were only a few minor changes in the laws concerning egged lobsters from 1917 to

the present. In 1948, the law was changed to state that egged lobsters would be marked by cutting a V-shaped notch in the tail, rather than being marked by a round hole punched in the tail. In addition, egged lobsters would only be purchased from people licensed by the Commissioner, a change designed to aid enforcement efforts (Laws of Maine 1947).⁸ In 1973, the law was changed to specify that the "V-notch" was to be placed in the "right flipper next to the middle flipper" (Kelly 1990:4).

The big change in the V-notch program took place on the informal level, when increasing numbers of lobster fishermen took advantage of the law to conserve the resource by voluntarily cutting notches in the tails of the egged lobsters they had caught. Eddie Blackmore said that it was the young returned veterans [from World War II] who were responsible for the change: "We decided that if we were going to keep it [the fishery] going, we needed to do something to replenish the supply." One of the primary ploys they used was to take advantage of the V-notch law by *voluntarily* cutting notches in the tail flippers of egged lobsters. Former Commissioner Vinal Look points out, "there was never a law that stated that fishermen could not cut V-notches in the tails of egged lobsters." It became increasingly popular to do so. It is one of those cases, perhaps rare, where a formal law was turned into an informal norm.

The current V-notch law gets a mixed reaction from observers of the industry. On the whole, lobster fishermen consider this the most important conservation measure in force today. In their view it has resulted in a very large brood stock, which ensures that there are an adequate number of eggs in the water. However, Federal and state biologists are not convinced, pointing out that a V-notch in the tail of a lobster may become a source of infection. As a result, they have worked long and hard for passage of the Federal fisheries management

plan, which would not include either a V-notch or an oversize measure. As we shall see, this resulted in a battle over the V-notch lasting more than 20 years, which greatly influenced the course of lobster management.

The Escape Vent: 1978

From 1976 to 1978, there was a great deal of interest within the bureaucracy and the industry in establishing an escape vent law. Such a law would specify that a space be built into each trap, by one means or another, to allow the small, sub-legal lobsters to escape from the traps before they were hauled up. This would reduce the amount of time it took fishermen to clean out their traps. It would also reduce the numbers of lobsters killed or mutilated, since small lobsters are eaten by larger lobsters in the traps and by large fish after they are thrown overboard and on their way back to the bottom; molting lobsters are also eaten by any hard shell lobster in the trap . In addition, lobsters tend to hang on to the traps, and regularly have claws pulled off by fishermen who are attempting to remove them and throw them overboard. An escape vent would reduce the numbers mutilated in this way.

By the mid-1970s, the escape vent was an idea whose time had come. Massachusetts and Newfoundland had established such laws in the 1970s (Martin and Lipfert 1985:109). In the United States, state and Federal biologists were very interested in reducing mortality on sub-legal lobsters. In the mid-1970s the entire research staff of the Maine Department of Marine Resources became strong advocates (Krouse and Thomas 1976). Spencer Appolonio , who was commissioner at that time, recalls that "Cecil Pierce of Southport developed a plastic vent. We [i.e., the DMR biologists] tried it out in a tank, and it clearly worked. " "The DMR then made the escape vent mandatory by regulation," and within a year, a proposal for an escape vent became

part of the proposed federal American Lobster Management Plan (Maine Commercial Fisheries, October 1978c).

Some fishermen, at least, saw virtue in escape vents. A few scattered along the coast had already been placing escape vents in their traps. "Highliner" (highly successful fisherman) Jimmy Brackett of Pemaquid Harbor said that "one of the secrets of success was to have one lathe on the bottom of the trap with a large space" to reduce the amount of work cleaning out small lobsters from traps and to increase the catch of legal-sized lobsters. Eddie Blackmore, president of the Maine Lobstermen's Association, recalls, "after I had escape vents in all my traps I was saving an hour a day pulling (hauling traps) and two to three gallons of gas." In the debate that followed, some of these men became the strongest advocates of the escape vent.

In 1976, Representative Greenlaw of Stonington introduced a bill in the Legislature (Greenlaw 1978) mandating an escape vent. This produced a good deal of heated discussion in the industry and the Legislature. Greenlaw withdrew the bill in the face of opposition led by Representative Bonnie Post (Owls Head) who, speaking for the fishermen in her district, argued that the escape vent was something that fishermen should do for themselves, and that in any case, the issue needed more study before it should be enacted into law. In the meantime, a sizeable number of fishermen began to support the idea of an escape vent. Maine Lobstermen's Association President Eddie Blackmore strongly endorsed the idea, and the Association worked for the bill on the local level.

In the next session of the Legislature, Representative Post introduced an escape vent bill. During the hearings that were held up and down the coast, it became apparent that the bill had many enemies in the industry, but a good deal of strong support as well. Commissioner Spencer

Apollonio, who moderated many of these meetings, recalls that there was a lot of opposition to the bill in scattered locations, particularly in the Rockland area and parts of the eastern coast, but no well-orchestrated attempt was made to scuttle it. It passed in the Legislature over moderate opposition in 1978 (Laws of Maine 1978), and went into effect in 1979. Twenty years later, the escape vent has tremendous support in the industry. Eddie Blackmore said this "is probably the best single thing we have done in the past fifty years." Although the law was modified in 1987, and again in 1992, basic support for the law has never wavered (Jones 1985a; Kelly 1990: 12-14).

In retrospect, the escape vent law passed so expeditiously because it was strongly supported by the Department of Marine Resources, the leadership of the Maine Lobstermen's Association and a majority of the fishermen, as well as members of the Legislature's Committee on Marine Resources. In this respect, it is perhaps unique in the history of the industry.

The Players, Alliances and Maine Lobster Legislation

History did not repeat itself. Each law involved different issues and different players who had varying amounts of power and who had very different goals. The genesis of the first conservation legislation in the 1870's and 1880's was the result of what Judd (1988) has called commercial rivalry between lobster canners and the live lobster industry, each of which proposed legislation reserving the resource for itself. Conservation was a slogan, and not an important goal. In this contest, scientists and the bureaucracy played little role. The double gauge law of 1933 came about in the middle of the most serious crisis the lobster industry and nation had ever faced. The industry was badly split on the issue of the double gauge. Under these conditions, Commissioner Crie, who was very much influenced by scientists, and legislative allies were able

to persuade the Legislature to pass this controversial measure with the long term good of the resource in mind. Legislation for the escape vent was passed with the support of the DMR bureaucracy, the marine resources committee of the Legislature, and a sizeable faction in the industry led by M L A President Eddie Blackmore. For all parties, conservation was a a primary concern.

Despite these differences, there are some common elements to be found in the process producing these laws. Without question, fishermen have had more influence over legislation than any other group. Vinal Look, ex-commissioner of the Department of Marine Resources, said that "the Legislature has never passed an important regulatory bill without substantial support from the industry." This means that anyone wanting to understand the development of lobster legislation at the state level must focus on the strategic choices of various groups of fishermen and the process of negotiations among them. The industry has long been interested in conservation, especially in recent decades. But where industry is concerned, conservation is of less importance than distributional issues.

The Legislature and the Department of Marine Resources had a strong influence on the legislation that emerged. While the Legislature and DMR often have different goals, they have one dominant interest that distinguishes their actions from those of the industry: an interest in conserving the resources of the ocean which they hold in trust for the public. It is a responsibility they have taken very seriously. To be sure, the Legislature is always careful to assess public support and the interests of their constituents, but in the last analysis, conservation has been a primary emphasis. This is, perhaps, only to be expected. All governments have an interest in promoting economic growth, both to increase revenues to the state and to build political support

in order to stay in power (Knight 1992:191).

Second, the actions of the government changed outcomes. To be sure, neither the DMR nor the Legislature could dictate rules that had little or no industry support. But agents of the government could and did enter into coalitions with various industry factions to get the support needed to pass certain pieces of legislation. In these cases, the agents of the government had enough power to insist that bills be altered in ways that met their own agenda. The double gauge law, for example, was the result of an alliance between Commissioner Horatio Crie and a faction of the lobster industry in the western counties, which wanted a smaller minimum gauge. Neither could have attained their goals in the absence of the other. Commissioner Crie was able to use industry support for a smaller minimum size measure to get a double gauge law, which protected both juvenile and reproductive-sized lobsters.

Forty five years later. Commissioner Spencer Appolonio and MLA President Eddie Blackmore worked hard to ensure passage of the escape vent law. The law almost certainly would not have passed had these men pulled in different directions. Robin Alden and her allies in the Legislature were able to use strong industry support for a trap limit to fashion the Zone Management Law.

Scientists played a decidedly secondary role in the generation of conservation legislation at the state level. Pronouncements by scientists concerning industry problems were certainly not enough to ensure that remedial legislation was forthcoming swiftly. Richard Judd (1988:598) points out that "there was no simple one-to-one correlation between biological necessity and conservation law."

Scientists have, however, been a primary source of management ideas and data. The

original size limit laws, the laws protecting egg-bearing females, the double gauge law, and the escape vent law originated with European scientists. Sometimes it took decades for these management ideas to be enacted into law. The double gauge was proposed by biologists just after the turn of the 20th century, but no law was enacted until 1933. The idea of a trap limit has been bandied around for over thirty-five years. Ideas of scientists were eventually incorporated into state laws, but only after powerful factions in the industry realized they could be used to further their own agendas. This underlines the fact that "scientific facts" are often little more than ammunition that can be seized on by contestants when it serves their interests.

Conservationists are latecomers to the game. As we shall see in Chapter 6, they entered the fray only in the 1990's in an effort to force Federal Agencies to enforce federal legislation. They played no role in producing any state legislation.

Note: does this come after Chapter 5.

Analysis of Factors Promoting Laws at the State Level

A number of factors have had a marked influence on the development of regulations in the Maine lobster industry. While all of them have been discussed by rational choice theorists and others interested in the production of norms, they fall into no well-integrated theoretical mold.

Distribution Fights

Jack Knight's hypothesis goes a long way to explain the production of some, but not all, of these laws. He has hypothesized that most institutions come about as a byproduct of conflict over resources in which there are multiple equilibria and asymmetrical power relationships (Knight 1992:123-32). The party that will be able to establish a norm favoring itself is the one

with the greatest share of the resources (Knight 1992:132). This explanation is applicable to the generation of three of the most important lobster conservation laws. The first minimum size measure and prohibition on taking egged females, the double gauge law, and trap limits all came about as byproducts of negotiations over distributional rewards.

The first size regulations and prohibitions against taking egg-bearing females were instituted during the course of a battle between the canners and the live lobster industry over control of the lobster supply. At first, the canners succeeded in persuading the Legislature to pass seasonal rules and size regulations to constrain the live lobster industry and reserve the catch for themselves. After 1879, the live lobster industry succeeded in lobbying for laws that ultimately made it impossible for the canners to stay in business. The live lobster faction won because they had more support in the public, the press, and the Legislature.

The same overriding distributional concerns dominated the long battle for the double gauge law. Here the fight was between a faction composed of fishermen in the western part of the coast, dealers, and hotel owners who all wanted smaller, cheaper lobsters (i.e., nine inch lobsters) to expand their markets, and a faction of fishermen primarily in the eastern part of the state opposed to lowering the gauge to prevent a flood of lobsters from Canada, which they thought would benefit the dealers. Neither side had the resources to gain an advantage until Commissioner Horatio Crie, an able political entrepreneur, and members of the Marine Resources Committee formed a coalition with the industry faction wanting a smaller gauge, in exchange for their support for the double gauge.

In both the case of the first conservation laws of 1870's and 1880's and the double gauge law, fishermen in the eastern part of the state were pitted against those in the west. In this

contest, the fishermen in the east were at a distinct disadvantage, since there are fewer fishermen east of Penobscot Bay. More important, there are only two counties along the eastern coast and six in the west. Since this disparity gives fishermen from the western part of the coast more influence in the Legislature, they were able to force through rules in their favor.

The trap limit is the result of twenty-five years of conflict over distribution of the resource. Essentially, trap limits are devices used by fishermen using smaller numbers of traps to constrain the efforts of men with more gear. Large fishermen resist such constraints, especially when trap limit rules would result in a higher proportion of the catch going to the hated "part-timers." The Zone Management Law was an innovative way of dealing with this distributional problem. By allowing different zone councils to set their own regional trap limits, the law minimized conflict among demands coming from different regions of the state, with their different fishing practices.

In the case of all three of these laws, there were multiple solutions to the problem (i.e., multiple equilibria), each of which would benefit one industry faction more than another by allocating to it an increased part of the catch. People in the industry were, of course, fully aware of this fact and fought strenuously in the legislative arena for laws which would benefit them. The faction that ultimately succeeded was the one that had the most resources, in terms of numbers of votes and power in the Legislature. In every case, this meant forming a coalition with agents of the government, who had their own agendas. The laws that emerged were compromises incorporating features desired by powerful industry factions to gain control over the lobster resource, and others which agents of the government were able to insert in the bill (e.g., the double gauge law and the Zone Management Law [trap limit]).

The processes by which these three lobster regulations have been generated serve as a reminder of one of the most basic axioms of the new institutional economics and rational choice theory, namely that regulations are rarely neutral; they usually help some people more than others. "Individuals realize this, and that they attempt to change institutions to serve their ends more effectively" (Ensminger 1992:xiii).

Social Conventions

The escape vent law and the V-notch law came about as the result of an entirely different process. The interactions that generated these rules are best modeled as pure coordination games of the type described by Lewis (1969) and Sugden (1986). In such games, there is a "coincidence of interests among the actors" (Lewis 1969:14). Such games may have multiple equilibria, but one of them is preferred by everyone. Moving to this solution benefits everyone.⁹

At the time they were enacted, both the escape vent and the V-notch laws were widely perceived as equally benefitting everyone in the industry, and serving the cause of conservation as well. By passing these laws, the Legislature helped fishermen as individuals, moved the industry as a whole closer to Pareto Optimum, and satisfied bureaucrats concerned with their public trust responsibilities. The process by which these laws were passed was far less acrimonious than that resulting from the distribution battles described above.

Beyond these similarities, the circumstances surrounding the passage of the escape vent and the V-Notch program were quite different. The escape vent law came about through formalization of an existing practice; the V-notch law took advantage of a formal law to build a conservation program by decentralized means.

Support for an escape vent law came about very quickly in the 1970's since the DMR

bureaucracy, members of the Marine Resources Committee of the Legislature, and a sizeable majority of the fishing industry led by MLA President Blackmore were well disposed toward it. Many people in the industry supported the proposal, influenced by the fact that some "highliners" had tried escape vents and found them advantageous. In a sense, the passage of this law was tantamount to the formalization of an informal practice. Many laws are, in fact, generated in this fashion (Knight 1992:85).

The V-notch program is an informal institution building on the possibilities presented by a formal law. The original law was designed to save a few thousand seed lobsters. Fishermen saw the possibilities inherent in this situation and proceeded to V-notch very large numbers of the egged lobsters they caught in the interests of conservation. Their voluntary activities have made the program far more effective than its originators ever dreamed in 1917.

Political Entrepreneurs hip

Political entrepreneurs played a crucial role in the development of some of the most important lobster conservation laws. The double gauge law would not have been passed were it not for Commissioner Crie; and MLA President Eddie Blackmore played a key role in lobbying for the passage of the escape vent laws. Similarly, as we shall see, Commissioner Alden was a strong supporter of co-management. These people wielded no unusual power, nor could they provide rewards; rather, they were critical in changing people's attitudes toward legislation by pointing out to various groups the benefits to be gained. In this regard, Taylor argues that the ability to change attitudes is the most important function of political entrepreneurs (Taylor 1990: 233-34).

Discount Rate and the Conservation Ethic

All of those playing a role in producing lobster legislation are motivated, at least in part, by a concern for the long run well being of the resource. Their motives differ somewhat, however. "Conservation" of the resource has been the holy grail for the scientists, whose are dedicated to preserving the ecosystems of the earth and ocean. The Legislature and bureaucrats, by way of contrast, tend to think in terms of preserving a valuable industry and the incomes of voters. Periodically, the industry will set aside distributional concerns and support legislation to protect the lobster stocks. In the last 70 years this has happened increasingly as the industry has developed a conservation ethic. However, the motives of the industry are clearly more commercial. They know that if the resource is destroyed, it cannot provide them with an income stream in the future. They have a low discount rate because they value that income stream.

The political support for every law discussed in this chapter has been wholly or partially motivated by a concern for ensuring the well being of the lobster stock. In some cases, such as that of the escape vent, a concern with conservation is the primary motive of all concerned, bureaucrats, legislators and industry alike. In other instances, only some of the parties involved are motivated by a sense of stewardship. In the fight for the double gauge, only Commissioner Crie and a few legislators were concerned about the resource.

Path Dependency

The development of lobster conservation laws reveals a high degree of path dependency. Choices that were made in the 19th century opened some avenues for regulation and closed off others. In the late 19th century, it became axiomatic among biologists and fishermen that they key to conserving the lobster resource was the preservation of lobsters in critical parts of their life cycle, namely juvenile and reproductive-sized lobsters. This became part of the ideology of the

industry (Geertz 1973). The first rules in the 1870's accomplished these goals by a minimum size measure and a prohibition against taking egg-bearing females. These laws set a precedent which has not changed to this day. All of the important legislation that followed was built on the same principle and was designed to protect the breeding stock (i.e., the 1917 seeder law, the 1933 double gauge law, and the V-notch program), or to protect the juveniles (i.e., the escape vent and increase in the legal minimum size). Once large numbers of people in the industry became convinced such rules were effective, it would have cost a great deal to change them, in the form of a political firestorm.

Notes

1. Rosen (1995: 4) says of professional fishery managers, "Our role in debate before public and political bodies should be as professionals who serve as objective interpreters and purveyors of scientific information." He quotes Livingston as writing "In conservation we have always assumed a dealing between ourselves and everyone else; a civilized, adversary proceeding in which reason, logic and meticulous argument, liberally laced with horrible precedent, would persuade just men and women to our position. Unfortunately, for reasons and resources, it has not worked."

2. The smallest lobster that can be taken currently must be three and one quarter inches on the carapace and weigh a minimum of one and one-eighth pounds.

3. Lobsters in pounds suffer mortality due to cannibalism, particular on lobsters that have the misfortune to shed, and to disease, especially gaffkemia. But pound owners try to minimize such mortality on lobsters they own.

4. To read some of the testimony and debate, one would have thought that the life blood of the industry was lobsters thirteen inches and over.

5. In the years between World War I and World War II, catches ranged between five million and seven million pounds in most years, one fourth of what they had been in the 1890s (Maine Department of Marine Resources 1995). The causes of this decline are complex; and there is little consensus on the cause (see Acheson and Steneck 1997).

6. The double gauge law appears in Maine Public Law, 1933, c.2, sec.89. It was amended in 1935 (Laws of Maine 1935, Chapter 294 "An Act Relating to Measurement of Lobsters").

7. The V-notch will last through several molts and serves to protect egg-producing females for a period of several years. This rule is thought to be especially effective in conserving the largest females, which may not extrude eggs every year. Such animals may extrude over one hundred thousand eggs every other year.

8. Apparently some unscrupulous dealers and fishermen continued to scrub the eggs off berried females and sell them. When caught with egged lobsters in their possession they would claim they were saving them for the "seeder program."

9. In this sense the establishment of the escape vent and the V-notch laws are not really a collective action problem as defined by Elster (1989: 24-27) where rational action (i.e., defection) by an individual can lead to a Pareto inferior outcome.

Checked by Ann: Bibliography done Dec 2, 2000. Bib corrected 4/24/01. Reviewers comments added 9/14/01

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Chapter 5

CO-MANAGEMENT IN THE MAINE LOBSTER INDUSTRY

Establishing Co-management in Maine

Co-management came about with the passage of the so-called Zone Management Law for the Maine lobster industry (Public Law 1995, Chapter 468), enacted by the Maine Legislature in the spring of 1995. This arguably was the most important piece of legislation concerning the lobster industry passed in the 20th century. It is a very wide-ranging law that changed many aspects of the governance of the lobster industry. It established an individual trap limit of 1,200 traps by the year 2000, a trap tag system to identify owners of traps, an apprenticeship program for new entrants into the lobster fishery, and eligibility criteria to qualify for a commercial lobster and crab license. Most important, it was designed as a true co-management law, giving the lobster industry control over managing certain aspects of the lobster fishery, while retaining most authority for management in the hands of the Department of Marine Resources and the Legislature. This law established a framework by which the Commissioner of Marine Resources could create lobster policy management zones. These lobster zones are managed by an elected council of lobster license holders. The councils were empowered by the 1995 law to propose three different kinds of rules for their zones, the maximum number of traps each license holder is permitted to fish (a trap limit), the number of traps that may be fished on a single line, and the

time of day when lobster fishing will be allowed. If the proposed rules are passed by two-thirds of the license holders in the zone, voting through a referendum process, they are referred to the Commissioner of Marine Resources who is empowered to adopt rules to enforce them under the regulatory powers of the Department (Alden 1995: 4b; Jones 1995b: 8a). If the proposed rules are passed by a vote of two-thirds of the license holders in the zone, the zone council is obligated to convey the results of the referenda to the Commissioner of Marine Resources. If the commissioner judges them to be "reasonable," the commissioner can use his regulatory power to establish the rules as departmental regulations enforceable by the Marine Patrol (Alden 1995: 4b.; Jones 1995b: 8a).

Why did the Legislature pass such a law? Co-management, after all, is a radical concept. The reason, in brief, was that a few powerful people in the Legislature and bureaucracy saw in co-management the wave of the future. More important, more of them saw that a co-management law could be framed in such a way as to solve some problems that had stymied the Legislature for decades. The passage of the Zone Management Law was, in great part, a response to the Legislature's frustration over its inability to pass a trap limit law, and its long term problems with limited entry (Sonnenberg 1991).

Shortly after the trap escalation began in the 1950s, people in the lobster industry began calling for a trap limit (i.e., a ceiling on the number of traps a license-holder could use). The proponents argued that a limit would confer benefits on all. One would catch as many lobsters if everyone were restricted to the same number of traps, and there would be substantial savings, in that fewer traps would have to be built, baited, and tended. Moreover, fishing a smaller number of traps, it was argued, would permit fishermen to use smaller and less costly boats which could be operated by a single person, rather than larger vessels requiring crews of two and three people.

Perhaps most important, a trap limit would also alleviate the problems of trap congestion and gear tangles, which had become very severe.

The first effort to get a trap limit was made in the late 1950's. Representative Chester Rice avers that one or more trap limit bills have been introduced in every one of the last fifteen sessions of the Maine legislatures. One of the most important efforts was the Jackson bill of 1974, which came close to passing. This law would have combined a trap limit with limited entry and zone management. The Maine Lobstermen's Association proposed bills calling for traps limits and limited entry in 1979 (Billings 1979), in 1985 (Billings 1985a); and again in 1991. All of these bills were defeated. The basic problem was a lack of consensus in the lobster industry, which quickly translated into a lack of political support for these bills in the Legislature.

Efforts to establish a trap limit have always foundered on two issues. First, there is a strong feeling that a trap limit will do no good unless it is coupled with a limit on licenses ("limited entry"). The logic is that a trap limit will not relieve congestion if new fishermen can still come into the industry, bringing with them thousands of new traps. However, limited entry has always been received with ambivalence because such legislation would mean prohibiting young people from entering the lobster fishery, one of the few employment possibilities available in many coastal towns (Acheson 1975a:663-65).

Second, and more important, the majority of fishermen agree that there should be a limit on traps, but no one agrees on what the limit should be. Part of the problem is that the average number of traps fished varies widely from one part of the coast to another. A trap limit that would be acceptable to people in eastern Maine, where six hundred traps is considered a large number, would be completely unacceptable in an area such as Casco Bay where fishermen commonly have over eighteen hundred traps. Moreover, within each town the so called "full

time" fishermen generally fish far more traps than the "part-timers," who have other jobs. Thus, attempts to get trap limits engender two sources of conflict: between different areas of the coast, and between full and part-time fishermen in any single harbor (Acheson and Wilson 1996a). This has resulted in a lack of consensus in the industry and a general lack of support for any trap limit proposal in the Legislature.

Moreover, the conflict over trap limits is exacerbated by the fact that such limits have severe distributional effects. Trap limits do not constrain all fishermen. They force those fishing over the allowable maximum to reduce the number of traps they fish. This is likely to affect the big fishermen, and may not force the small or average fishermen to make any changes at all. In the process, however, the percentage of traps small fishermen have on the bottom is increased relatively, giving them a higher percentage of the catch. From this perspective a trap limit is a means by which small fishermen can constrain big fishermen and lower their proportion of the catch.

This lack of consensus on the trap limit and legislative fears about limited entry translated into a lack of political support for any specific bill. The result was stalemate for several decades.

But the pressure on the Legislature to pass such a bill was unceasing (Acheson 1975a: 666). Representative David Etnier said, "I would go to Five Islands and places in my district and all I would hear is 'Why don't you do something for us? Why can't we get a trap limit?'. "

By the 1990s, other forces and ideas were gaining momentum that were to result in a trap limit in the aftermath of other legislation. There was a good deal of interest in co-management. Many people interested in fisheries management had become convinced that standard ways of managing fisheries were failing, and that new approaches needed to be tried. Over the course of twenty years, a sizeable body of literature has been produced documenting the local level

conservation rules found in a large number of fishing communities (Acheson 1972, 1975; Anderson and Simmons 1993; Berkes 1989; McCay and Acheson 1987; Ostrom 1990; Pinkerton 1989; Ruddle and Johannes 1985). In 1993, the idea began to float around the Maine fishing industry and Marine Resources Committee of the Legislature after a session on co-management at the fishermen's forum organized by Jim Wilson of the University of Maine. I was one of the participants. **(Endnote 1).**

Perhaps most important, the legislature and Maine fishermen had some experience with aspects of co-management. As early as 1974, lobster fishermen became familiar with the idea after an unsuccessful effort by Representatives Greenlaw and Jackson to pass a bill dividing the cost into zones with different trap limits and limited entry provisions. Moreover, after lengthy debate, in 1994 the Maine Legislature passed a sea urchin management law dividing the industry into two zones with different management rules. In addition, in 1994, Amendment five of the American Lobster Management Plan had divided federal waters into zones and established "Effort Management Teams (EMT's) composed of industry members to make management recommendations for each zone. (See Chapter 6).

In the spring of 1995, the Legislature was under some pressure to pass a law reducing effort to bring Maine into line with the "federal lobster measures proposed by the effort management teams (EMT's)" (Plante and Jones 1995) that had been established by the New England Regional Council. Accordingly, a bill was prepared, which would be sponsored by Rep. Chester Rice, proposing a four year moratorium on new state lobster and crab licenses. It would also contain a trap limit of 1,200, which would be reduced to 800 traps over a period of years, to be in accord with federal rules for the zone beyond the three mile line (EEZ), as well as a number of other provisions such a prohibition on lobster fishing on weekends during the summer (Plante

and Jones 1995). A controversial part of the bill was a provision to grant licenses only to people who had been active in the fishery and had caught lobsters in 1993/1994, which would eliminate hundreds of inactive or part-time fishermen.

In the early spring, the prospects for a trap limit law did not look bright because there was a good deal of opposition from the fishermen in Casco Bay, and the Down East Lobsterman's Association. The Marine Resources Committee modified the bill by dividing the coast into zones as a means to get more political support. The idea of zones appealed to legislators since they knew that allowing different areas of the state to have different trap limit tailored to local conditions and practices would increase industry support.

Robin Alden herself, who was confirmed as Commissioner of Marine Resources in February, 1995, did as much as any person to foster the need for co-management. She had become increasingly interested in co-management after serving on Regional Council and seeing the problems with "top down" federal management system first hand. Throughout the spring and early summer of 1995, she lobbied for co-management in the Department of Marine Resources, with industry members, and with members of the Legislature.

In April, 1995, the Legislature's Joint Standing Committee on Marine Resources held a series of hearings on a number of issues including a limited entry bill sponsored by the Maine Lobstermen's Association. But it was clear that the Committee's primary interest was focused on the other issues, such as trap limits and co-management. A number of industry representatives, academics, and agency scientists were asked to testify before the committee. I was one of them. In my testimony, I supported the co-management concept arguing that if fishermen had management authority they would impose on themselves those conservation rules which they believed were effective in conserving resources, and which were in their own best

interests. This would foster a sense of stewardship and reduce enforcement costs. I found out later that several others who had been called to testify, said many of the same things in different ways. Our testimony in aggregate probably helped to push forward the cause of co-management in the Legislature, but it was clear that many key members of the Marine Resources Committee had already become very interested in co-management by the time the hearings were held.

In April, May, and early June, the co-management bill was negotiated in the Marine Resources Committee. The sponsor of the bill, Rep Chester Rice, worked hard for its passage. Rep Joe Bigl negotiated many compromises. There was much to negotiate, since provisions that were acceptable to some members were unacceptable to others. Rep Theone Look from Jonesport supported the ideas of zones, since she saw in this concept a way of getting rules with combinations of features acceptable to various parts of the coast. Her constituents in Washington County were very opposed to limited entry and were generally averse to trap limits. She favored the apprenticeship program, however.

By June the bill was framed in final form (Jones 1995a), and in July, at the end of the legislative session, the bill passed (Public Law 1995, Chapter 468; Jones 1995b).

In retrospect, the law was framed in a way that allowed the Legislature to navigate several shoals and snags. It produced what fishermen wanted, a trap limit. To be sure, the state-wide trap limit of 1200 was too high to be considered a real trap limit by those favoring limiting traps, but it did avoid threatening many large fishermen who went berserk when even lower trap limits were mentioned. The zones management law contains a mechanism for coming to grips with one of the major stumbling blocks for trap limits—namely strong disagreements about how many traps would be permitted—by allowing different areas of the coast to establish their own limits. The law also addresses the need to couple a trap limit with limited entry by passage of the

apprenticeship program. This provision was designed to slow entry into the industry in a way that would help to professionalize the fleet, and increase the sense of stewardship of those in the industry. But at the same time it ensured that all people who really wanted to go lobstering could get a license eventually, which assured those legislators and industry people concerned with the all-too-real-problem of a lack of alternative economic opportunities in small fishing towns, especially in the eastern part of Maine.

The law had another virtue from the point of view of the Legislature. By giving the zone councils power to make recommendations on trap limits, fishing time, numbers of traps on a line, [and limited entry later], the Legislature was divesting itself of several vexing, long term problems. All of these rights given to the zone councils involve very contentious issues.

The passage of the Zone Management Law came as somewhat of a surprise. Even close observers of the industry, such as Maine Lobstermen's Association Executive Director Paton White, admit they are not sure "how and why it got passed." Certainly it was not a law for which they had lobbied. The industry was interested in co-management, but industry leadership had lobbied for a trap limit combined with limited entry, and what emerged from the Legislature had zones and no limited entry provision. Once the law was passed, the leadership of the two lobster fishermen's associations (the Downeast Lobsterman's Association and the Maine Lobsterman's Association) became enthusiastic supporters of the law and worked hard to see it implemented.

Others were much less enthusiastic. A group of fishermen from eastern Maine filed a lawsuit seeking to nullify the law. This suit was later judged to have no merit (*Bangor Daily News* 1996; Jones 1996e). Many full-time fishermen all over the state were leery of the law, since they believed it would favor the part-time fishermen who would have a majority of votes. Some part-time fishermen (with other jobs) were fearful that the full-time fishermen would pass

laws restricting the time when fishing could be done (e.g., prohibiting fishing on Saturdays or after 4:00 P.M.) which would force them from the industry.

Many observers of the industry, including some experienced politicians, were convinced that the law was desperately flawed. I recall a conversation with an ex-legislator who had served several terms on the Marine Resources Committee. He said, "This law is designed to fail. You can't expect lobster fishermen to cut their own effort. If this law passes, you will have a big dog fight up and down the coast."

Five years after the zone management law was passed, it is clear that the criers of doom were wrong. The co-management law has clearly been a success so far. By the summer of 1998, all seven of the zones had passed trap limits of 600 or 800 traps. By October, 2000, four of the seven zones (i.e., zones D,E,F,G) had gotten entry rules for their zones, and Zone B had begun the limited entry process and will likely get limited entry regulations early in 2001. This means that the Legislature framed a law allowing lobster fishermen to generate rules curtailing their own exploitive efforts for the long run benefit of the fishery. They took full advantages of that opportunity.

Implementation of the Law

Despite the predictions of disaster, implementation of the zone management law went ahead rapidly since its passage in June 1995. In the fall of 1995, an implementation committee was appointed by the Commissioner to convert the legislation, which had been framed in general terms, into regulations, a workable management program (Jones 1996a). This committee was composed of Paton White and David Cousins, officers of the Maine Lobsterman's Association, Junior Backman, President of the Downeast Lobsterman's Association, fisherman John Williamson, and three academics from the University of Maine, Jim Wilson, Alison Rieser and

myself. The law merely stated that the Commissioner was empowered to divide the coast into zones led by a zone council. These zone councils could make recommended rules on the number of traps to be fished, the time of day fishing would be allowed, and the number of traps on a single line. These recommended rules could only be enacted into regulations if they were approved by a 2/3 vote of the license holders in that zone, and were deemed as "reasonable" by the Commissioner, in accordance with the Administrative Practices Act. The law also said licenses would be granted only to people who had completed an apprenticeship program. The law said nothing about how many zones were to be established, where the zone boundaries would be, how representatives to the zone council were to be chosen, what the bylaws of the councils were to be, etc. These recommendations were made by the implementation committee.

By February 1996, the implementation committee had produced a report containing a set of guidelines that gave shape to the zone council system and the entire co-management effort (Jones 1996a). It recommended that five zones be formed, which were to be divided into electoral districts containing approximately 100 lobster license holders each. Since there were approximately 7000 license holders, each zone would have approximately 1400 license holders and 14 districts. Thus, each zone council would have approximately 14 members. These council members would presumably know the fishermen in the district well and be able to represent their viewpoints in the council.

It was determined that each license-holder would be able to cast one vote in the elections for representative to the zone council and a single vote in each referendum regardless of how many traps they fished. The committee considered giving fishermen different numbers of votes depending on how many traps they fished. It hardly seemed fair that an amateur with five traps would have the same voting power as a full-time fisherman with more than 1000 traps. This

suggestion was forwarded to the Attorney General's Office, which ruled that it would be unconstitutional. One person was to have one vote. But as we shall see, a great deal of trouble between part-time fishermen and full-timers might have been avoided if some kind of weighted voting system had been put in place.

In order to avoid conflict over boundaries, the committee made initial recommendations on where the boundaries of the five zones should be. They were deliberately placed to divide areas with different fishing practices, and where traditional boundaries had already been established. In addition, the committee recommended that license-holder could fish in multiple zones, but that they would have to abide by the rules of the most stringent zone. Thus, if a person choose to fish in waters of a zone with 1000 traps and in another with an 800 trap limit, that person could only have 800 tags.

The implementation committee choose not to deal with two issues of importance: the apprenticeship program and the zone council bylaws. It was decided that the apprenticeship program would be developed at a later date because this was such a sensitive issue that attempts to specify how a person would pass an apprenticeship might jeopardize the entire zone management effort. As a result, the implementation committee made no recommendation about the specifics of the apprenticeship program. The committee recommended that each of the five zones would have interim zone councils composed of members appointed by the Commissioner. These interim councils would finalize the boundaries of the zones, establish election districts, and write the bylaws for the councils (Jones 1996c:22a; Jones and Plante 1996:17a).

In Maine, hearings must be held before commissioners of departments of government can promulgate regulations. Accordingly, hearings were held in seven locations up and down the coast in January and February of 1996. At these hearings, which were chaired by Prof. Jim

Wilson of the University of Maine, there were a good many questions about the specifics of the plan and the governance structure, but the general tone of the comments was very favorable to the idea of local level management. The implementation committee edited its plan, and the final version was presented at a session of the Fishermen's Forum on March 2, 1996. The earlier part of the meeting was dominated by a series of fishermen who objected to various aspects of the plan. But the feelings of the majority of industry in attendance showed when fisherman Ted Bear gave a speech at the end of the meeting strongly supporting the idea of local level management. He got thunderous applause. We on the committee were much relieved.

After these hearings were finished, the recommendations of the implementation committee were made department regulations. They became the operational rules defining the way the co-management law in Maine works. In retrospect, virtually all of the recommendations of this committee survived intact. There are two exceptions: (1) the implementation committee recommended that sub-zones could be established. In the fall of 1998, the subzone task force, commissioned by the Legislature, recommended that "sub-zones would be discouraged." The implementation committee had initially recommended that five zones and zone councils be established; after the hearings were held in January and February, it was decided to establish seven zones.

In the spring of 1996, the Commissioner had appointed the interim zone councils (Jones 1996d); and by April 1997, these interim zone councils had completed their job. They did four essential jobs. They established the voting districts; established the initial boundaries for those zones; approved the bylaws for the zone councils; and organized the election of permanent zone council member (Jones 1997c: 18a).

Establishing voting districts went smoothly in most cases. The rules established by the

implementation committee were that one representative to the zone council was to be chosen for every 100 license holders. This caused no problem except for the permanently occupied islands, several of which wanted their own representative even though they had far under 100 members. This issue was settled by vote. In Zones B, C and F, islands were given their own representatives; in Zone D, they were not.

The individual zones' bylaws were written by several different people at different times. The Zone G by-laws were written by a lawyer, who created a very complicated document, complete with election rules, procedures for proposing referenda, rules concerning district meetings, etc. Zones A, B, and C had another set of bylaws which were only one page long, developed by Junior Bachman, the DMR Resource Coordinator in that region. Terry Stockwell, the Resource Coordinator for the western part of the coast, developed by-laws for zones D,E and F by amalgamating the Zone G bylaws and those used in the eastern part of the state. In 1999, after the Zone G lawsuit, the Department of Marine Resources hired a lawyer to produce a standard set of by-laws for all zones, one hopefully avoiding the pitfalls that would lead to more lawsuits.

(Figure 1 goes here)

Map of the Seven Lobster Zones

The Work of the Permanent Zone Councils: Legislative Dominos

Trap Limits

The permanent zone councils began operation in the late spring of 1997. While it became apparent that the zone councils had a variety of different concerns, two issues came to demand most of their attention initially. First, the Commissioner of Marine Resources involved the zone

councils in the right whale issue, which involved a lawsuit brought under the Marine Mammal Protection Act that which threatened the entire lobster industry (DMR News 1997:4B). Even though the zone councils were not empowered to deal with such issues, they devoted considerable time to lobbying industry members to frame an industry-wide response. (The right whale issue will be discussed in greater detail below.)

The second concerned trap limits. In August 1997, the Zone E council voted to submit a referendum to establish an 800 trap limit by 1998, a 700 trap limit by 1999, and a 600 trap limit by 2000; in September the Zone G Council voted to have a similar referendum, which would establish a build-down to establish an 800 trap limit by 2000 (Commercial Fisheries News 1997b: 5b). Both of these referenda passed easily. The rest of the zones followed in the next few months. By the summer of 1998, all of the zones had held referenda in which trap limits were passed (DMR News 1998b)..

The vote in favor of trap limits in all cases was overwhelming. In Zone E the trap limit passed with 80 percent of those casting ballots voting "yes;" in Zone G 81 percent voted yes on the first ballot, and 82 percent voted yes to a more stringent trap limit later in the fall of 1997 (Jones 1998c: 14a). In Zone D the trap limit vote "passed by 77percent of the votes cast" (DMR News 1998a). In Zone A the trap limit passed with 88 percent of the vote; in Zone B 94 percent voted yes to a trap limit; and in Zone C the trap limit passed with 82 percent voting in favor (DMR News 1998b). Despite the huge plurality, the losers, who were generally men fishing a lot of traps, took their defeat very hard, and caused several different kinds of problems.

Two political forces were involved in producing trap limits within the zones. The first of these was conflict between fishermen with a lot of traps and those who fished small numbers of traps. The trap limit votes in all councils were driven by the large number of small and medium

sized fishermen, who had grown tired of watching "big fishermen" or "hogs" take a disproportionate amount of the lobsters and cause huge trap tangles in the process.

Another factor motivating the zone councils to pass trap limits quickly was the threat of federal action. The ASMFC announced one plan in 1996. The National Marine Fisheries Service were convinced that the ASMFC plan did not restrict fishing effort enough to conserve the lobster. Harry Means (NMFS) said of the ASMFC plan "There are no provisions in the plan that are meaningful. I'm not convinced this will freeze effort or achieve the objectives of the fishery management plan" (Plante 1997c). Empowered by the Sustainable Fisheries Act, they readied their own plan in 1997 and 1998, which featured a "build down" to 472 traps over the course of five years. During this period the zone councils devoted considerable attention to these issues. On the whole they and their constituents were very much against the NMFS plan, and they came to favor the ASMFC plan. If the plan proposed by the ASMFC was not perfect, it was something they could live with. As a result, many zones, including zones B,C D and F deliberately framed their trap limit referenda to coincide with the recommendations of the Atlantic State Marine Fisheries Commission, which had proposed a 1,200 trap limit in 1998; a 1000 trap limit in 1999, and an 800 trap limit in 2000 (Jones 1998a). By framing their referenda in this way, they hoped to ward off more drastic action by the National Marine Fisheries Service. David Black explained the proposed referendum in Zone D by saying, "We are going along with the ASMFC. These are the trap limits which will probably [he hoped] be enacted anyway." The zone councils were not responding to their constituents. They were responding to a plan at the federal level, one which they hoped would pass.

The passage of trap limits greatly exacerbated the animosity and conflict between big and little fishermen. If the little fishermen had felt put upon by the big fishermen before the trap

limit, it was the big fishermen who felt victimized after the trap limits were passed. Trap limits, after all, constrain only the big fishermen.

Even more galling to the big fishermen was the fact that many small fishermen began to increase the numbers of traps they fished after the trap limit went into effect. In the views of some observers of the fishery, the trap limit was not so much a maximum number of traps; it had become a goal to achieve. The situation was made even worse by the fact that many commercial fishermen were moving into the lobster fishery on a full time basis, attracted by the record high lobster landings achieved in the late 1980's and the 1990's, while landings in most other fisheries declined. In 1978, approximately 20 percent of all lobster license-holders were considered "full-time fishermen;" in 1997, an estimated 58.3 percent earned 75-100 percent of their income from the lobster fishery, attesting to the huge growth in the numbers of full-time fishermen (Acheson and Acheson 1998: 11). In short, although lobster catches increased phenomenally in the past decade, the established "big" fishermen saw a disturbing proportion of that increase going to people with small and medium sized operations and to newcomers to the industry, at a time when they were forced to cut the amount of gear they fished. Under these conditions, it is scarcely surprising that many big fishermen were angry, feeling that they trap limit was working against them, and benefitting their competitors.

The large fishermen first fought against trap limits using strategies which were largely ineffective. In Zones C and F, where many of the zone council members were big fishermen, the zone councils refused for months to put out to referendum a trap limit. They finally agreed to hold a referendum in the spring of 1998 in the face of pressure from a large number of their unhappy constituents and the threat of oncoming ASMFC rules. It took months of agitation by their constituents to get them to put a trap limit out to referendum. In Zone F, the council

insisted on linking a trap limit with limited entry. Lyman Kennedy, at the 1998 Fisherman's Forum swore that he would not support a trap limit until the state government limited the number of fishermen. Within months he had relented.

In Zone G four big fishermen sued the state over the trap limit referenda that had been passed in that zone. In September 1997, the Zone G council proposed a referendum for an 800 trap limit to be accomplished in three years (by 2000). This passed, with 81 percent voting in favor. Later in the fall, a group of Zone G fishermen, who had wanted a 600 trap limit all along, presented the Zone G council a petition with over 200 signatures for another referendum for an 800 trap limit to begin earlier, in March 1998. When this referendum also passed with an 82 percent vote in favor in November 1998, a handful of irate fishermen complained to a legislator who tried mightily to persuade the Governor and the Commissioner of Marine Resources not to accept the referendum as "reasonable" and therefore not adopt a new regulation. After much divisive politicking, the Acting Commissioner stood behind the second vote for an 800 trap limit to begin in March 1998 (Jones 1998a: 16a.). At this point, a group of four fishermen from the towns of Kittery and Saco, who each had well over 800 traps, each hired a lawyer to sue the Department of Marine Resources in order to rescind the trap limit, on the grounds that it was enacted in the course of an illegal vote. They argued that the second vote violated the by-laws of Zone G, which stated that no referendum could be held on the same "issue" within a two year period. The essence of the suit was that the Zone G council had violated the bylaws when it passed two trap limit referenda within a three month period. In July 1998 a Superior Court judge issued a consent order prohibiting the DMR from enforcing the trap limit endorsed by the second referendum, and gave an opinion favoring the four plaintiffs. This meant that the trap limit remained at 1200 in 1998, 1000 in 1999 and 800 in 2000 (Jones 1998b: 9a). Most

fishermen in Zone G were very disappointed, feeling that the results of a legitimate election had been thwarted by a small handful of big fishermen with money to hire a lawyer.

In Zone E the big fishermen succeeded in having another trap limit referendum sent out to vote in the fall of 1998, over a year after the original vote to build down to 600 traps by the year 2000 had passed. In November of 1998, the fishermen of Zone E again voted overwhelmingly to uphold the 600 trap limit. Many of the big fishermen in Zone E, including Larry Knapp, the zone council chair were very disappointed. However, Terry Stockwell of the DMR said that an analysis of the vote revealed that 81 of the big fishermen from the Boothbay region did not vote. I suspect, despite all their vocal opposition to the 600 trap limit, they were very ambivalent about fishing large numbers of traps, and were hoping that the trap limit would be upheld.

Limited Entry and the Trap Cap

In the fall of 1998, the Lobster Advisory Council, an industry group advising the Department of Marine Resources and Legislature on policy for the industry, got to work on serious legislative proposals to solve the problems posed by trap limits. First, several "tiered license" proposals were discussed. These proposals suggested the establishment of different classes of licenses based on financial dependence on the industry, each of which would have a different trap limit and a different vote in zone council elections. The purpose was to allow full-time fishermen to fish more traps than various kinds of part-timers and have a greater voice in zone council elections. None of these license schemes ever came to fruition, primarily because it proved to be impossible to agree on the criteria for defining the different levels of licenses and how people could move among them.

In the winter of 1998/99, the Lobster Advisory Council worked on two other ideas which were eventually passed into law by the Legislature in June 1999. One was a trap tag freeze,

which essentially permitted people fishing under 800 traps to purchase only 100 more trap tags then they were issued as of November 20, 1998. License holders fishing over 800 could fish no more traps (Public Law 1999, Chapter 397). This law that went into effect was to last until 2001 when it was to be sunsetted. In the fall of 2000, the Department of Marine Resources decided that this law should be continued as it is for a period of years to slow the build up of traps, and accordingly recommended that the Lobster Advisory Council make this recommendation to the Legislature. It is likely that the Lobster Advisory Council will recommend that the Legislature do exactly this.

The other law (Public Law 1999, Chapter 508) established limited entry by zone. Both of these laws had considerable support in the industry and were enacted into law with little difficulty. In the industry support for these laws stemmed from both selfish and altruistic motives. Both of these laws are designed to further the objectives of fishermen with large amounts of gear, namely stopping entry into the industry (especially in the overcrowded western zones) and preventing part-timers from building up the amount of gear they fish while full-time fishermen are forced to reduce the numbers of trap they fish. They were, in the words of one full time fisherman, "our solution to the part-timer problem." But they were also motivated by the feeling that the industry genuinely needed to reduce effort.

Many in the industry, including the leadership of the Maine Lobsterman's Association, had long wanted limited entry. Limited entry legislation was first introduced in 1974 with the Greenlaw Jackson Bill which called for both a trap limit and limited entry. This bill was defeated after a group from Vinalhaven hired a lobbyist who argued that the law was unconstitutional. Another bill containing both trap limits and limited entry was developed in 1985-1986 by the Lobster Advisory Council and was endorsed by the MLA. This bill was not

taken to the legislature. Limited entry legislation was again introduced in 1992 and was defeated. Again, officers of the Maine Lobstermen's Association lobbied for a limited entry bill in 1995, but this effort came to naught. The legislature passed the Zone Management Law with an apprenticeship program, which Commissioner Robin Alden and some members of the Marine Resources Committee believed would restrict entry into the lobster industry and make limited entry legislation unnecessary. Many fishermen, including officers of the MLA, were very unhappy that the zone management law did not have a limited entry provision. In the words of one, when the Legislature passed the Zone Management Law, "it gave us only half the tool box we needed to do the job." In addition, they were unhappy that trap numbers continued to increase even after the trap limits had been put in effect. It took very little for these people to put limited entry back on the table again in 1997.

In 1997, limited entry legislation was introduced again at the urging of the MLA in the form of L.D. 1448. The legislature did not pass this bill, but rather passed a resolve that the limited entry question be studied by the Lobster Advisory Council, which was to give a report on the subject to the legislature in February 1998.

In the spring of 1999, the Marine Resources Committee and the Lobster Advisory Council produced a bill calling for limited entry by zones. The limited entry law (Public Law 1999, Chapter 508) passed by the Legislature in June 1999. It greatly extended the powers of the zone councils. This law specifies that the zone council can make a recommendation to the Commissioner of the Department of Marine Resources to limit entry by imposing a ratio of people allowed to get licenses for those that give up their licenses. A one to three ratio, for example, means that one person would be allowed to get a license for every three people giving up their licenses. If the commissioner agrees with the recommendation of the zone council, he or

she can impose that ratio. If he or she does not agree, he can impose a different ratio or none at all.

The law specifies an elaborate procedure to be followed to avoid problems with the anti-trust laws. First the zone council informs the commissioner of its intention to seek limited entry for its zone. At this point, the commissioner places a moratorium on the entry of new licensees into that zone. Then the zone council must do a "nonbinding survey" of zone license holders concerning their desires for limited entry and the in/out ratio they would like, and the results of this survey are entered into the record (Amory 1999b: 6B). Next the zone council makes its recommendation to the commissioner on the in/out ratio it seeks, following the results of the survey. The commissioner must hold a public hearing in the zone on the limited entry proposal. Only then can the commissioner impose the limited entry ratio using his/her regulatory powers. The bill further specifies that the commissioner must maintain a waiting list of people who want licenses in each closed zone. These people must have passed the apprenticeship program.

From early in the fall of 1999 until the summer of 2000, the zone councils wrestled with the issue of limited entry. Four zones, D, E, F, and G, voted to request limited entry; they began the process for limited entry in the fall of 1996, and the commissioner closed their zones to new entry at that time. In the early winter they carried out their constituent surveys.

In the meanwhile, with limited entry looming, the Department of Marine Resources had to wrestle with several problems. One was how to frame regulations to allow new fishermen to enter closed zones. That is, when an in/out ratio is passed, who gets in and how? Officials at the DMR decided that when limited entry was declared in a zone there would be a one time opportunity for fishermen with licenses to declare themselves as members of that zone. People without licenses could get licenses to fish in that zone in one of three ways.

Another decision had to be made concerning how many traps a person from one zone could place in another. There is little sense in closing a zone to new entrants and reducing the number of fishermen in that zone by an in/out ratio, if people from adjacent zones can place any number of traps in the waters of that zone. What would stop a person from Zone G from coming up to Zone D after it was closed and putting all their traps in Zone D waters? In order to solve this problem, DMR officials came up with the so called 49 percent/51 percent rule. This means that a person had to keep at least 51 percent of their traps in their own zone, and could place a maximum of 49 percent of their traps in the waters of another closed zone. This was a sensible solution to the problem, but one that was to have fateful consequences for boundary problems.

The four zone councils voted on limited entry ratios in May and June of 2000 and informed the commissioner of their recommendation; and the commissioner held public hearings on the proposed in/out ratios in the summer of 2000. The rules went into effect in September 2000. The commissioner approved a 1 to 1 ratio for zone D; a 2 to 1 ratio for zone E; a 3 to one ratio for Zone F, and a 2 to 1 ratio for zone G. Later in the fall, Zone B voted for limited entry and the commissioner approved a 3 to 1 ratio. Thus, by the end of 2000, five of the seven zones had.

In general, the zone councils tried to follow the wishes of their constituents as expressed in the surveys. The problem was, the constituents had such a wide range of ideas about limited entry that any limited entry ratio the zone council recommended would please only a minority. In Zone D, for example, the survey results, made available at the March 14, 2000 meeting, showed that 296 of 441 or 67 percent of those returning questionnaires answered "yes" to the question "Do you favor more limits on entry into the lobster fishery for new Class I, II or III license holders in Zone D beyond the two-year apprentice program?" One hundred forty five, or 33

percent, answered "no" to this question. Of those who answered "yes," 75 said they favored a 1:1 ratio; 65 favored a 2:1 ratio; 57 wanted a 3:1 ratio; 19 wanted a 4:1 ratio; and 82 wanted a 5:1 ratio. Eighteen said they wanted some other ratio. In short, if limited entry came to a referendum, there were just barely enough in favor to pass, given the fact that referenda need to be passed by a two thirds vote. Of those favoring limited entry, more license holders favored a 1:1 or a 5:1 ratio than any other. Moreover, at the Zone D meeting on May 2, 2000, when the vote to recommend limited entry was to be taken, several fishermen gave strong speeches against any limited entry provision at all because this would make it difficult for their children to enter the business. A couple of council members cautioned that the constituents in their districts favored limited entry because there was a real need to reduced the number of fishermen to reduce snarls and conserve the resource.

What does a zone council do with such information about the wishes of their constituents? After talking about the options for an hour, the Zone D council voted to recommended a 1:1 ratio to the commissioner. At the hearings that were held at the Samoset Hotel in July, the Zone D council was roundly criticized for not requesting a higher ratio to begin lowering the number of licenses in the zone. David Black, the Zone D chair, said he didn't even bother to go to the hearing. He thought the council had done the right thing, and he knew that regardless of what they had recommended, criticism was inevitable.

In general the commissioner gave the zone councils the in/out rations they recommended. Of course, the commissioner had played no small role in getting the councils to vote for low limited entry ratios. During the Spring, Terry Stockwell, the DMR Resource Coordinator, told the council members that the commissioner would not go along with a recommendation for an "unreasonable" limited entry ratio. At those same meetings, Laura Taylor, Assistant to the

Commissioner, presented figures showing that very high in/out ratios would result in people having to wait for decades to get a lobster license. As a result, Zones D, E and G dutifully requested relatively low ratios such as 1:1 or 3:1.

Zone F was an exception. In Zone F, where trap escalation had been the worst in the entire state, there was solid sentiment among full time fishermen that numbers of fishermen would have to be curtailed if the numbers of traps were to be reduced. This sentiment was reflected in the council, where sentiment for high in/out ratios ran high. At the May 3, 2000 Zone F meeting when the limited entry vote was taken, many council members said that they favored a high in/out ratio because the need to reduce fishermen and traps was still acute. One council member pointed out that the "Feds still say we are overfished. We need to bring the number of traps down." They were strengthened in this conviction by the news that there were three ways that people could become eligible for a license in a closed zone (i.e., one with limited entry). The news that any number of 18 year olds who completed the apprenticeship program could get a first class license, regardless of whether the zone was closed or not, came as a surprise to all present. Representative David Etnier said he "had never heard of the 18 year old rule." This clearly hardened their conviction to request a high ratio. Terry Stockwell told the council, "You should go with what you want for a ratio, but the commissioner will not approve a 5 to 1 ratio."

When the vote was taken, nine council members voted for a 5:1 ratio, four voted for a 3:1 ratio, and two voted for a 2:1 ratio. They also voted to turn down a motion to allow all those who had completed the apprenticeship program in Zone F to have licenses. All those at that meeting were convinced that the Zone F council was very serious about cutting effort and letting the chips fall where they may.

Late in the summer of 2000, after the hearings had been held on the Zone F council's recommendation, the commissioner approved a 3:1 in/out ratio. He said he would not support a 5:1 ratio, and he was as good as his word.

Zone A and Zone C are unique in that they are far more dubious about limited entry than the other zones. The sentiment against limited entry is especially strong in Zone A on the Canadian border. Most of the fishermen in this rural, sparsely populated area feel there is no need for limited entry. Some feel they could use more fishermen; and the vast majority do not want to put up barriers against young people who might want to go fishing. Fishing, after all, is one of the few means of earning a living in this easternmost part of Maine. Several people said that if the youngsters cannot go fishing, they will have no choice but to move away and the communities-already struggling to maintain their populations-will die. [There is nothing novel about this objection. It is one of the most common objections to limited entry in general. See Singleton 1998:139].

In the more overcrowded, harbors to the westward, far more fishermen favor limited entry. Here, there is a strong feeling that there are too many fishermen and too many traps. Much of the problem stems from the entry of a lot of part time fishermen and the trap escalation that has been particularly severe in this part of the coast. These differences are reflected in the in/out ratios that the various zone councils requested the commissioner impose. In Zone F and G; more council members wanted a 5:1 ratio than any other; in Zone A, by way of contrast the vast majority of the council members wanted no limited entry rules at all. No one voted for a 5:1 in/out ratio.

It is also reflected in the answers we received to questions concerning limited entry on our 1998 questionnaire.

Table 5.1 Question: Do you favor more restrictions on entry into the lobster business beyond the two year apprenticeship program ?

Zone	A		B		C		D		E		F		G	
	No	%	No	%	No	%								
No	125	65	72	65	54	39	100	40	47	34	48	35	54	49
Yes	68	35	39	35	83	61	150	60	91	66	90	65	57	51
Total	193		111		137		250		138		138		111	

Only 35 percent of those responding to this question in Zone A favored limited entry, while the percentage of those favoring it in the more western zones was much higher. In Zones E and F the percentages were 66 percent and 65 percent, respectively. Interestingly enough, in 1998 a large percentage of fishermen in the middle of the coast (Zones C and D) favored limited entry. Yet two years later, they have only been lukewarm towards the idea. The Zone C council has tabled the limited entry proposal; and Zone D requested and received from the commissioner a 1:1 ratio.

The 49 Percent/51 Percent Rule and Boundary Problems

The initial committee charged with implementing the zone management law thought no serious disputes would result from the establishment of zone boundaries, since these boundaries would coincide with existing informal territorial boundaries, and the rules made it possible for people to fish in two zones, providing they fish according to the rules of the most restrictive zone. But this committee had not contemplated the effect of limited entry. When limited entry legislation was being discussed by the Marine Resources Committee, several observers including

the Associate Commissioner of Marine Resources, Perm Estabrook, predicted that boundary problems would result. They were right.

All seven zones have become involved in boundary disputes since the passage of limited entry legislation. These disputes all involve contests over access to lobster bottom, which followed on the heels of legislation. The exact cause was not the same however.

Most of the boundary disputes came in the aftermath of limited entry legislation in 1999. The disputes between Zones A and B, zones C and D, Zones E and F, and F and G did not come to a head immediately, since these four zones had the same trap limit, leaving fishermen free to place traps where they had always fished. However, with the passage of the limited entry by zone law in 1999, all of this was to change. With limited entry came the realization that boundaries would have to be made impermeable. One could not have limited entry in a zone if one allowed license-holders to cross the border and fish in that zone with impunity. Thus, the so-called "49/51 percent" rule was passed by the Commissioner, limiting fishermen from one zone to placing a maximum of 49 percent of their gear in the area of another zone. This limited the activities of people from one zone who had "traditionally" fished a lot of gear in waters now belonging to another zone. Men from Portland (Zone f) who had long placed most of their gear in the winter in offshore waters east of Biddeford Pool and Kennebunk, now in Zone G, could no longer do so. It made it impossible for men from Spruce Head and Wheeler's bay (zone d) to place large amount of traps south east of Matinicus (Zone c) where some had been fishing in the winter for years...similar kinds of disputes arose on the boundaries of Zones E and f, and Zones a and B. People who had been disadvantaged objected mightily, even though a majority from most of these zones favored limited entry.

In all of these cases, the DMR and the zone councils attempted to adjudicates the disputes

by trying to devise new lines acceptable to all parties. They had little luck. The negotiations were complicated by the fact that all agreed that the zone boundaries should follow "traditional" fishing lines, and then tried to define their "traditional fishing grounds" in such a way as to give them strategic advantage in the negotiation. The large amount of area where "mixed fishing" is allowed made possible a number of interpretations.

Such problems have certainly dogged the negotiations over the Zone C and D boundary. This dispute appeared to be settled after a meeting in February 2000 in which the two zone councils agreed on a new line zigzagging the length of Penobscot Bay involving a buffer zone. But the agreement broke down when fishermen from Owls Head objected, insisting that the line be drawn to allow them to fish in a wedge shaped area they had recently wrested from Vinal Haven and Matinicus. After 31 meetings with the DMR Resource Coordinator, the two zone councils could come to no agreement..

The zone bylaws state that Zone Councils can establish a new boundary line by majority vote. If a dispute over a boundary cannot be solved by the councils themselves, mediation will take place. If mediation fails, then the commissioner is empowered to establish a boundary unilaterally. Certainly some of these boundary disputes have gone on for a long time. In some cases, such as the Zone C and D dispute, the Commissioner appears to be determined to force these fishermen to propose a zone boundary line agreeable to both sides. In other cases, the commissioner has used his regulatory powers to impose a boundary. In the early fall of 2001, he established a new boundary between zones F and G, which had been in contention over the boundary since 1997. Neither side is likely to be completely happy with the result, since the commissioner's boundary will allow Zone G fishermen to fish inside Portland harbor, well within the older Zone F boundary, while allowing the Zone F fishermen to fish two miles further

to the west in offshore waters than was the case under the original zone F and G boundary line.

In the winter of 2000, Rep. David Etnier (Harpswell) introduced a bill designed to solve boundary disputes stemming from the 49 percent/51 percent rule. This bill would have limited the authority of the zones and zone councils to the three mile zone. Outside three miles, traps could be placed anywhere, which would have allowed most people to continue fishing where they always had gone. This bill was passed in the House late in the spring of 2000, but was defeated in the Senate. Had it passed, it would have resulted in still other problems which would have demanded solution at a later date. For example, it would have made it possible for a person with a license in one zone to fish in any zone, providing that he only kept 49 percent of the traps within three miles and had 51 percent outside the three mile line. Such people could have circumvented the entire limited entry program.

The dispute between Zones D and E stemmed from a slightly different cause-namely a difference in trap limits. Zone E passed a build-down of traps in 1997, which was more restrictive than the one passed by Zone D. [Zone E was to achieve a 600 trap limit by 2000; Zone D was to have an 800 trap limit by 2000] This meant that people from Zone E could fish to the east of the boundary (Pemaquid Point), but those from Zone D, could not place traps to the west of that boundary. The Zone D fishermen were incensed over this turn of events, since it seemed unfair to them that they would be stopped from fishing in areas where they had always gone. The Zone D and E dispute simmered from 1997 to late in 1999. Two meetings were held to try to settle the dispute, but to no avail. Unfortunately, this dispute was especially bitter, since in the words of First Selectman Bob Fossett, "It split the town of Bristol down the middle." It turned fishermen from Pemaquid Harbor (Zone E) against fishermen from New Harbor (Zone D), who had gone to school together and in some cases were close relatives. After months of wrangling, a meeting was

held at the Bristol School on the evening of November 4, 1999. This meeting was called by the commissioner, who conveyed the word through intermediaries that he would consider the testimony given at this meeting and then make a final decision on the zone boundary. During the formal meeting, most of those testifying represented their side of the case. The only thing many seemed to agree on was that the whole zone concept was more trouble than it was worth and should be scrapped in its entirety. During the meeting, a proposed compromise line was suggested by Richard Cheney of New Harbor. The meeting broke up without the two sides being able to come to agreement. After the meeting, however, several fishermen from both sides continued to talk. Within a half an hour, they had hammered out a compromise line, almost identical to the one proposed by Richard Cheney in the formal meeting. In the weeks that followed, several influential fishermen, including Brian Sawyer of new harbor, organized more meetings with the commissioner to iron out details and build support among the fishermen for the agreement. Early in 2000, a new boundary line involving a mile wide buffer zone at Pemaquid Point was established by the commissioner, essentially formalizing the line agreed to by the local fishermen..

The problem concerning the Zone b and c boundary stemmed from an administrative error. Somehow this boundary was not drawn on official maps as originally envisioned by the initial zone council members who approved the boundary. It begins at Naskeag Point rather than Newberry Point, passes through the middle of the Swan's Island conservation zone, and ends at a place on the south that is in contention by fishermen. A new line was successfully negotiated by the two zone councils and approved by the commissioner in the summer of 2001.

All of these boundary disputes were caused by passing zone boundary rules that affected access to fishing areas. In the negotiations that followed, groups of fishermen and zone councils

attempted to move them or maintain them with access to fishing bottom in mind. The single exception to this is the Zone C and B problem. Of all of these disputes, only the Zone B and C problem and the dispute between Zone D and E concerning the waters around Pemaquid Point were settled by negotiations among zone councils and fishermen themselves. The other disputes will likely not be settled until the Commissioner forces the issue or makes the decision himself. Bottoms-up management has some limitations.

Implementing the License Moratorium, Apprenticeship Program and the Trap Tag System

The Zone Management Law contained three other provisions that went into effect in the first few years after the law was passed: a license moratorium, apprenticeship program, and a trap tag system. While they were not as contentious as the trap limit issue, they will have a radical effect on the way the lobster fishery is conducted.

License Moratorium

The license moratorium was designed to put a cap on the number of lobster licenses and remove the inactive license holders from the fishery. Under this provision, only people who could demonstrate that they were in the fishery in 1993 and 1994 were allowed to get licenses in 1996. License holders demonstrated their involvement in the fishery by showing some kind of written evidence to the nearest warden, who then certified the person as eligible for a license. Several problems came to the fore. The major issue concerned who should be allowed in the fishery. Since the criteria were very loose, a good many were permitted to get a license who would have been excluded if more stringent criteria had been employed. At one point, anyone who could show a "substantial investment" was given a license. Laura Taylor, the Assistant to the Commissioner, said that "all you had to do was show any paper connecting you to the fishery and you were virtually assured of getting a license." There were a series of waivers of the

requirements. Anyone who was 65 years old who had any history of lobstering was given a license. People who were sternmen were also granted class 1 licenses.

Still, some people were denied licenses. Many of them went to their legislators, who proceeded to intercede for their constituents with the Department of Marine Resources. Rep. Ken Honey said early in 1998, "There were 8 or 10 people in Boothbay Harbor who did not renew their licenses for some reason. This was very foolish. Now they are doing a lot of hollaring and screaming." As a result, many fishermen felt that the moratorium was not working at all, and the rumor spread that a lot of people were entering the fishery by cheating and presenting false affidavits to the wardens. Norman Lemieux, the chair of Zone A, was quite concerned about the entry of more fishermen into the lobster fishery, especially fishermen from the dragger fleet, who had no conservation ethic. In retrospect, there was a decrease in the number of licenses between 1995 and 1998, not a large increase, but that was not the perception in the industry at the time. The perception that many new fishermen were entering the fishery was due, in no small part, to the many fishermen, who had had lobster licenses, who became full time lobstermen at this time. There was widespread perception among lobster fishermen that many people were cheating their way into the lobster industry; and this unquestionably fueled support for the limited entry by zone legislation that came about in 1999.

How many people were denied licenses due to the moratorium? It is difficult to say. What we do know is that in 1995 there were 7690 licenses, and in 1999, that number had dropped to 6704 (see Table 1.2). But it is impossible to tell how much of this decline is due to the moratorium, since an unknown number of people left the fishery, while others entered. Some left the fishery for other jobs, others retired, and still others gave up their class one licenses to get student licenses. [The student license program had just been established. This license was

cheaper, and gave people right to fish only 150 traps.] At the same time, others entered the fishery. Some of them had not held licenses in 1995, but many had had licenses, but had been inactive in the lobster fishery. However, these numbers suggest that the moratorium did reduce the number of license holders, if it did nothing to reduce the number of full time fishermen or traps.

Only in 1998, was the moratorium really enforced stringently. From 1998 to 2000, there was no possibility of additional people entering the lobster fishery. However, the license moratorium only lasted until January 1, 2000. This meant that new fishermen could enter the zones that were not closed by the limited entry by zone law. Since no limited entry provisions had been passed in Zones A, B and C, people who had completed the apprenticeship program were free to enter these zones after January 1.

Apprenticeship Program

The apprenticeship program went into effect in 1996. This program was designed to limit entry into the fishery, and in many quarters it was hoped that it would prove to be enough of a barrier that a limited entry law would not be necessary. [This proved to be false, and now both the apprenticeship program and the limited entry law are in force.]

When the law was passed, the implementation committee assumed that it would have both a practical work requirement and an educational requirement. In fact, only a work requirement was implemented. To pass the apprenticeship program, an applicant must work for a minimum of 200 days of a lobster boat. These days must be at least five hours long. The number of days must be certified by the captain of the boat; and every 50 hours also had to be certified by a warden. No more than 20% of these hours can be maintenance or yard work.

Commissioner Robin Alden formed a committee to implement the educational component

of the program in 1997. I was charged with drawing up the plan. The apprenticeship program I proposed was design to help professionalize the industry. It has units on lobster biology, state and federal conservation legislation, Coast Guard regulations, safety at sea and firefighting, navigation, etc. The committee met once to discuss the draft plan, and then it was shelved for reasons that I still do not understand. One DMR staff person told me that fishermen in the eastern part of the state were opposed to an educational component; another said that the DMR did not have the financial resources to run the course. Still a third said that "Robin Alden was interested in getting an educational component for the apprenticeship program. When she resigned in November 1998, the program fell apart." In the fall of 2000, Robin Alden herself is working on a plan for the educational component of the apprenticeship program.

The apprenticeship program got off to a slow start. In February 1998, two years after the program began, only 20 people in the state had signed up for the program. By the summer of 2000, 280 people had joined the program.

In 2001, the apprenticeship program was given a strong boost by events in Zone C. A large number of fishermen in Zone C were leery of supporting limited entry because they did not want to make it impossible for young people to enter the industry. But they also recognized that some limit on new licenses had to be devised. One person from the Zone C council expressed fears that after the zones bordering Zone C (i.e. Zones B and D) had passed limited entry ratios that Zone C would see an influx of new fishermen unless they did something. After months of talk, they had a local representative introduce into the legislature bill to allow Zones to have a expanded apprenticeship program as an alternative to having limited entry with a in/out ratio. This bill was modified to apply to Zone C only. The law allows the zones to enact by referendum four or five different optional ways of limiting entry via an apprenticeship program. These

include extending the amount of time an aspiring lobster fisherman must spend in the apprenticeship program, a requirement to apprentice only in zone C, and imposing an educational component. This law will go into effect in September 2001; and it is expected that the first action of the Zone C Council will be to send out a questionnaire to find out which options have support with the fishermen of the zone. The Zone C experiment will be carefully watched. If it succeeds, other zones might follow suit.

Trap Tag Program

The Zone Management Law also specified that all lobster traps were to be equipped with tags with a number identifying the owner of the traps. These aluminum tags are purchased from the Department of Marine Resources each year for \$.20 each. They must be attached to each trap in the water by March 1 (Stevens 1998). Since the intent of the trap tag program was to make it possible to enforce the trap limit, a license holder can only buy the maximum number of tags permitted by the trap limit regulations of the zone of which he is a member.

The trap tag provision went into effect in March of 1996 (Jones 1996b). It made fishermen very uneasy. Many thought that federal or state governments might use the number of tags purchased to implement a trap build down. That is, they feared the government might rule that trap numbers would be cut by a certain percentage a year. Although Commissioner Alden assured fishermen that the trap tag system would "never be used against them," many fishermen were very leery of having to document the number of traps they fished. Their suspicions were well founded, because the NMFS lobster management plan, put forth in 1998, proposed exactly the kind of build down many feared.

As a result of this kind of suspicion, fishermen tend to buy more traps tags than they use as

a means of grandfathering themselves into the fishery. The widespread practice of purchasing more tags than one plans to use makes it impossible to judge the number of traps actually in use. It also makes it appear that far more traps are in use than are being placed in the water.

How many more trap tags are being purchased than are being used? Our 1998 survey provides some data on this question. We gathered data on the number of traps fished, the number of trap tags purchased, the zone license holders are in and data on personal characteristics. This permits us to calculate the number of unfished traps per zone and say something about the people who are fishing more or less traps than they have tags for.

Table 5.2 Mean tags bought, mean traps fished, and estimated unfished traps per zone, 1997

	Zone A	ZoneB	ZoneC	ZoneD	ZoneE	ZoneF	ZoneG	State
Mean tags bought	571	494	591	667	466	615	703	593
Mean traps fished	541	422	540	646	428	577	638	552
Percentage of difference	5.25%	14.57%	8.62%	3.15%	8.15%	6.17%	9.24%	6.91%
Total traps per zone*	376,309	213,649	420,267	620,832	213,257	504,757	206,804	2,555,875
Estimated unfished trap tags*	19,756	31,129	37,951	19,556	17,381	31,144	19,109	176,611

* Information on total traps per zone (used in calculating estimated unfished trap tags) was provided by DMR.

If these data are correct, then the problem of "extra tags" [tags purchased, but not used] is

not as great as rumor would have us believe. In the state as a whole, there were only 176,611 tags purchased, or 6.9% of the total, which are not being used on traps. For some reason, the practice of purchasing "extra" tags is greatest in Zone B and least in Zone D.

Table 5.3 Difference between traps fished and trap tags purchased, 1997, by zone

	Zone A		ZoneB		ZoneC		ZoneD		ZoneE		ZoneF		ZoneG		STATE	
	no.	%	no.	%	no.	%	no.	%	no.	%	no.	%	no.	%	no.	%
Fewer tags than traps	18	8.8	6	5.0	17	11.6	42	15.9	21	14.5	18	12.0	11	9.6	133	11.6
Equal tags and traps	96	46.8	52	43.3	54	37.0	115	43.6	47	32.4	70	46.7	49	42.6	483	42.2
1-100 more traps	63	30.7	35	29.1	36	24.6	71	26.9	48	33.1	43	28.7	22	19.1	318	27.8
101-300 more traps	24	11.7	19	15.8	31	21.2	29	10.9	23	15.8	15	10.0	24	20.9	165	14.4
Over 300 more traps	4	1.9	8	6.7	8	5.5	7	2.6	6	4.1	4	2.7	9	7.8	46	4.0
Total	205	100	120	100	146	100	264	100	145	100	150	100	115	100	1,145	100

Table 5.3 shows a wide variation in differences between the numbers of tags purchased and numbers of traps fished. Forty two percent of the fishermen on whom we have information fished the same number of traps and tags. A higher number (46% of the total) of people had more tags than traps. Sixty percent of these (318 of 529) had 100 or fewer tags more than they had traps. Only a small minority (46 of the 529 or 8.7%) had 300 or more tags than they had traps.

A relatively small number of fishermen (11.6% of the total number in the state) reported fishing more traps than they had tags for. Some of these men undoubtedly misread the question or inadvertently gave the wrong information. Others openly admitted violating the law and fishing more traps than they had tags for. Their explanations ranged all the way from a lack of money to patriotism.

A number of concerns have surfaced about the characteristics of people with unequal numbers of trap tags and traps fished. Those reporting fishing more traps than they have tags for appear to be concentrated more in Zones D and E than in other places in the state; relatively few appear to be in Zones A, B and G. However, the numbers of people reporting more traps than tags is quite low, so that these results cannot be considered completely reliable.

To some extent, the difference between trap tags bought and traps fished appears to be linked to age and percentage of income earned in the lobster fishery. Of the people who have over 300 or more tags than traps, 45.6% are in the 31-40 age bracket. Among those who report having fewer tags than traps, a higher percentage are also in this age bracket (Acheson and Acheson 1998).

The data show that it is the full-time lobster fishermen who have more tags than traps fished. Eighty percent of those having more than 300 more tags than traps earn 75-100% of their income from lobstering, and those buying 101-300 more tags than traps fished earn 50-74% of

their income from lobstering.

Other Laws

In the period between 1995 and 2000, two pieces of legislation were passed at the state level that did not directly involve the zones and zone councils. One was the owner/operator law. This law required vessels used in the lobster fishery be owned and operated by the lobster license holder. If the vessel were owned by a corporation, the "majority owner" of the corporation would have to operate the vessel and have the lobster license (Public Law 1997, Chapter 693).

The owner/operator law was designed to prevent corporations and people who were not license holders from owning vessels. In New Hampshire, Schaftmaster Corporation had bought a fleet of large trawlers, operated by hired captains and crews, which it used to tend large numbers of lobster traps in the waters outside the three mile limit. The Maine lobster industry wanted to prevent that kind of corporate take over from occurring. It also wanted to deal with the "two boat problem," that is, individuals who had one boat in their own name and another in the name of another person, allowing them to operate as many complements of traps as they had vessels. One person had his own boat and traps. He also had three skiffs in the names of his children, who had student licenses permitting them to have 150 traps each. This gave him an extra 450 traps.

This law was developed by DMR officers and the Lobster Advisory Council. Various versions of this law were discussed at several meetings of the Lobster Advisory Council which wrestled with a number of issues, including the way to define "majority owner" in the case of corporate owners. The law was submitted to the Marine Resources Committee in the spring of 1998, and was enacted into law in the 1998 session of the Legislature with a lot of support from the lobster industry.

A special law was passed exempting the owners of Metinic Island, who had long used

hired fishermen to exploit the waters of the island, to protect the "family business."

In 1999, the Maine Legislature altered the trap limit law to permit only a certain number of traps per boat (not individual). The intent of this law is to stop a fisherman from exceeding the maximum number of traps allowed in the zone by having a full set of traps in his name and a large number in the name of another licenseholder. This was done in response to pressure from the ASMFC to keep Maine in compliance with ASMFC rules, not the zone councils. However, this boat trap limit is difficult to enforce. It is legal, after all, for anyone with a license to own traps, even wives, children and sternmen.

Running the Co-management Institution

In 1995, the zone management law created two legal units: the zone councils and districts within those councils. Subsequently, the Lobster Advisory Council, a unit which existed prior to 1995, was modified to serve as an intermediary body between the DMR and the zone

Since 1997, when the first interim zone councils were appointed, the various units involved in the co-management process have developed a way of interrelating and doing business that are becoming standard. Some of these practices are framed by the legislation itself, others by the regulations of the Department of Marine Resources, and still others are the result of more informal processes.

The key unit is the zone councils which are composed of members elected by license holders in each zone. The zone council members then elect a chair and a secretary. The chair runs the council meetings and is involved in all aspects of running the council. The secretary, as the name suggests, keeps the notes of the meetings.

For the past several years, zone council meetings are held every month during the fall, winter and spring. The councils adjourn from June to September. The meetings are ordinarily

held in public buildings in a central location in each of the Zones. The Zone G meetings are held in Atlantic Hall in Cape Porpoise, Zone F meetings at the Yarmouth High School, Zone B meetings at the Somesville Fire Station, while the Zone A meetings are in Machias, generally at the Bluebird Motel or the University of Maine at Machias campus.

The meetings are ordinarily held in the early evening, and last from two and a half to three hours. By law they are open to the public. However, the meetings are ordinarily attended by council members, the DMR resource coordinator, and perhaps 10 to 15 fishermen. Perhaps a member of the legislators, a member of the marine patrol, a biologist, or a newspaper reporter might also be present.

Meetings have a printed agenda which is made up by the council chair in consultation with the DMR resource coordinator. Most of the items on the agenda are put there by the two functionaries, although any member of the council can put an item on the agenda, and members of the public can suggest agenda items to be taken up at the next meeting. The agenda is typed by DMR personnel, put on the DMR web page, sent to the local newspaper, and distributed to council members. The chair of the council will sometimes give copies to others who show an interest in council affairs. The agendas usually begin with introduction and a motion to accept the minutes of the previous meetings, and then take up old business and new business. In the meeting, there are usually reports on events at the state and federal level by DMR employees, usually the resource coordinator, and perhaps a member of the legislator who will give a update on laws pertaining to the lobster industry. At one or two times during the meetings, there will be a period when questions and comments from the audience are allowed. The meetings will end with a proposal to set the next meeting date.

The length of the agenda will depend on the issues at hand. Some agendas will have as

few as ten items, including introductions, and adjournment. Others can have as many as 18 if a number of pressing issues are coming to a head.

According to the bylaws of the zones, zone council meetings are supposed to be run by Roberts rules of order. In some cases, Roberts rules are really used as intended, but in other cases meetings are run in ways that would make Roberts blanch. As one person phrased it, "We run by Robert's rules of order except when we don't." Zone D meetings are always according to the agenda, and people do not speak unless being permitted to do so by the chair. Zone E meetings are always more chaotic, with council members and even members of the audience speaking at will.

In many cases, issues have been discussed beforehand and a decision has been made before the meeting. In such cases the discussion can be perfunctory unless a surprise element is added to the conversation by a DMR employee, a legislator or a members of the public. In other cases, there is little agreement, and long, protracted discussions can take place between council members. When contentious issues or important legislation are pending, discussions on an issue can last for several meetings.

Council members are elected for staggered three year terms. When a vacancy occurs for a zone council position, the DMR notifies the voting district that nominations for the position will be accepted for a specific period of time. At the end of this period, the election date is set and ballots are mailed to each eligible voter in that district. The ballots are send to the DMR which counts the votes and announces the winner.

The districts within the zones are far less organized. As envisioned by the implementation committee, the members of districts are supposed to convey their wishes and views to their council representative, who represents their views in the zone council. Unfortunately no rules

were generated to ensure this happens. Districts are not required to have meetings and only a few of them-particularly in Zones G and D-do so. Many zone representatives take their job seriously, try to work for the best interests of their districts, and stay in touch with their district members by phone or radio. However, in most cases communication between districts and the councils is not what it should be. Fisherman Ted Ames, who has been very critical of the Zone C process, goes so far as to say that most council members do not even know who is in their districts (Ames 1999b: 14C). In most zones, fishermen with something to discuss with the zone council bypass the districts all together and go directly to the zone council meetings.

As a result of these kinds of communication problems, the zone council process has come to rely on mail surveys to gather information on constituent wishes. Before every trap limit referendum, each zone council, working with the DMR, mailed out a questionnaire to all of the eligible voters in each zone. The questionnaire was drawn up members of the zone council, usually a sub-committee, and printed up and mailed to the voters by personnel of the DMR. The questionnaires were returned to the DMR, which tabulated the results and then gave the results and the questionnaires to the zone council chair. This procedure was so successful that it will likely be continued before any other referendum, even though it is not required by law or departmental regulations. A mail survey, however, is required by law to be send to all license holders in a zone by the commissioner before any limited entry regulations are promulgated. Surveys are well on their way to becoming part of the political culture of the zone management process.

A number of those elected to the first zone councils in 1997 had no intention of serving their constituents in general, but rather chose to represent their own interests or those of a minority of their constituents. This caused serious problems in a number of zones. One zone had three

problem representatives. One never came to meetings; another was a "big fisherman" who would not hear of any proposal to cut effort; the third was a "small fishermen," who vigorously promoted any and all effort reduction proposals, regardless of merit. The activities of these representatives resulted in a good deal of acrimony in this zone.

In Zone C a large number of big fishermen got on the council and did all they could to avoid holding a referendum on a trap limit, despite the fact that the majority of fishermen in this zone, as in all other zones, favored such a limit. The result was not only general unhappiness in Zone C; their actions also fueled an attempt by fishermen from Isle au Haut to establish their own sub-zone.

In the second round of elections, in 1999 and early in 2000, many of these self serving representatives were voted out of office. Some were self serving; others had not been able to deliver what their constituents wanted.

In 1996, the implementation committee envisioned the need for coordination between the councils. It recommended the creation of a "council of councils" by the Legislature to adjudicate disputes between the zones and act as an advisory board to the commissioner. The membership of this unit was to consist of two representatives from each of the zone councils. The Legislature never created such a unit. Instead, the Lobster Advisory Council, which had been created by prior legislation, was modified by legislation to serve this function. The Lobster Advisory Council consists of a representative from each of the zone councils, who is elected to this position by each zone council, three lobstermen at large representing the eastern, central and western part of the coast, two lobster dealers [one from the east and other from the west, and a public member. No DMR personnel or legislators sit on the Lobster Advisory Council.

Normally the Lobster Advisory council meets several times a year or monthly when

important business is pending. The meetings are always held at the offices of the Department of Marine Resources in Hallowell, two miles from the state capital in Augusta. DMR employees do much of the staff work for the Lobster Advisory Council.

The purpose of the Lobster Advisory council is to serve as an advisory body to the commissioner. When the Zone Management system was put in place, it was envisioned that the Lobster Advisory Council would be a conduit of information between the councils, the DMR and Legislature, and serve as a means to resolve conflict between the zones. Instead, the Lobster Advisory Council has come to perform the function of legislative advisory group for the commissioner and Legislature. That is, the legislation is suggested by the commissioner, and discussed in detail by the Lobster Advisory Council which modifies drafts of bills. When the bill is complete, it is given to the Marine Resources Committee of the Legislature, which then puts it through the usually legislative process.

Since 1997, the Lobster Advisory Council has taken the lead role in framing all important legislation passed concerning the lobster industry. In 1997, it devoted many meetings to developing the owner/operator law. In 1998 and 1999, it spent the entire year discussing ways to deal with the inequities produced by the imposition of trap limits. The limited entry law and the trap cap law were the result of its deliberations on this problem. In 2000, it wrestled with the problem of extending the trap cap.

However, many fishermen and Lobster Advisory Council members feel that it has become almost an arm of the commissioner—a tool in helping to implement top down management. There is some justice in this complaint. The Lobster Advisory Council does not take the initiative in acting on proposals of the zone councils and fishermen. Rather, it studies proposals for legislation which the Department has on its agenda, by a process of interacting with Department

personnel, scientists, academics, and members of the Marine Resources Committee of the Legislature. The proposed legislation is then directly communicated to the Legislature, and reported to the zone council members as fait accompli. There is little opportunity in the process, for the zone councils and fishermen in the districts to review, comment on, or modify the actions of the Lobster Advisory Council. The lobster industry is not ignored in this process. The two industry associations, especially the Maine Lobsterman's Association, are making a point of working through the council process.

Since 1998, even members of the Lobster Advisory Council have come to feel used. In the fall of 2000, the Lobster Advisory Council was asked to approve a Departmental initiative to request that the Legislature extend the trap cap law beyond 2001 when it was scheduled to be sunsetted. One member noted there was no opportunity to even tell anyone in the zone councils what was happening. He was not pleased. Many members have reacted by simply missing meetings. During 2000, a number of meetings of the Lobster Advisory Council did not have a quorum.

In the fall of 2000, officials of the DMR have taken note of the problem. There is an effort underway to try to encourage the members of the Lobster Advisory Council to make proposals reflecting the wishes of the industry and councils. The objective, in the words of Terry Stockwell, is to put the "co" back in co-management.

Implementation of the Zone Management Law at all levels has been hampered by longstanding social and cultural patterns, which have made it difficult for fishermen to communicate and cooperate with each other and operate as intermediaries between fishing communities and the state bureaucracy.

If the zone council system is to work as envisioned, council members from all of the

different harbors in the region must work cooperatively with men from their own council and others. They have no experience in inter-town cooperation. The convoluted nature of the shoreline does not facilitate contact. Moreover, fishermen in different communities tend to view each other with some suspicion, which is not surprising given the fact they are members of groups with a history of conflicts over fishing bottom. Most who have been elected to the zone councils have made a valiant effort to work together. Still, the past is difficult to overcome. Zone council meetings have been held in which council members from towns currently in territorial conflict would not even look at each other, much less speak to each other. The zone councils have managed to accomplish a good deal, but there can be no question that the traditional social organization of coastal Maine does not facilitate the business of the zone councils. It is something to be overcome, rather than a basis on which such cooperative endeavors can be built. Zone council chairs and members also need to be politicians who are adept at dealing with highly controversial issues. Being effective on a zone council requires a lot of time, patience, flexibility, and negotiating skills, along with a willingness to learn the issues, the law, and the bureaucracy. One council member said, "I have learned more here about government than I did in my political science course." But more than knowledge is required: they need to understand two different sub-cultures and be able to work effectively in both. They need to be able to understand their constituents and the intricacies of fishing, and at the same time be able to work with state officials and legislators in negotiating solutions to complex problems. This is very difficult, given the fact that fishermen and bureaucrats have different world views, operate under different kinds of constraints, and have mastery of very different bodies of knowledge. *In this respect, they are in the position analogous to that of the East African chief of the 1950's, between the British Colonial administration and the so called "natives" on the ground (Fallers 1955: 290-305).*

The skills required of zone council members have not been easy for many to learn. Despite the fact that lobster fishermen are small entrepreneurs and have a variety of skills, the vast majority have no training or background that has given them experience in running meetings, writing bylaws, proposing legislation, or negotiating creative management solutions. The fact that the zone councils have done so well is a testament to the intelligence, flexibility, and willingness to learn of their members, the leadership ability of the council chairs, and the effectiveness of the DMR area coordinator, hired to help the councils communicate between the bureaucracy and the fishing communities.

Fatigue and burnout have also been problems. Council members have put in untold numbers of hours talking with constituents and attending meetings to the detriment of family life and their business. One zone chair said that his income dropped by \$10,000 during 1998. They have also had to deal with emotionally charged situations in which they have had to shoulder a good deal of blame for the results of the regulations they proposed. Every major legislative or regulatory push has come at the cost of months of tense meetings, confrontations, and conversations with angry constituents.

Actions at the federal and ASMFC levels and added a considerable burden to the zone councils and their members. During 1997 and 1998, for example, two competing plans were being proposed for the lobster industry. One, as we have seen, was by the ASMFC; the other by the NMFS. After months of talking, a consensus was reached in the Maine lobster industry to support the ASMFC plan, because it seemed more reasonable and effective. The zone councils were at the vortex of this struggle. They devoted considerable time and effort to support the ASMFC plan. As we have seen, several Zone councils framed their limited entry proposals to coincide with the trap limits being proposed by the ASMFC. Many council chairs and members

also testified at the hearings on the NMFS Plan, which were held at several locations throughout the spring of 1998. They also took part into what proved to be very effective negotiations, which finally resulted in ASMFC plan being endorsed by the NMFS.

Adding to the confusion and stress was the right whale controversy, which will be covered in some detail in the next chapter. The essence of the problem is a series of suits protect the right whale under the Marine Mammal Act and Endangered Species Acts between 1996 and 2000. These caused a lot of work and soul searching for the Zone Councils. In 1996, for example, a suit was brought under the Marine Mammal Act. It was claimed that rights whales were being killed by being entangled in lobster gear (University of Maine 1996). In June 1997, the Commissioner of the Department of Marine Resources called on the lobster zone councils to help assess the sentiment of the fishing industry in an effort to frame its response to the National Marine Fisheries Service whale plan. In the months that followed, the zone councils devoted considerably time to the whale plan negotiations. (Commercial Fisheries News 1997a). As we shall see, their efforts met with a good deal of success and resulted in a plan in which the DMR, the zone councils, and volunteer fishermen agreeing to work with the Coast Guard to create a monitoring system to track and disentangle whales.

However, these activities took a tremendous amount of time and diverted the zone councils from doing what they were empowered to do. Knowledgeable observers in 1997 and 1998 thought the zone councils would be overwhelmed, and that these side issues threatened the very existence of the co-management experience in Maine. Attendance at meetings dropped, some zone council meetings were acrimonious and chaotic, and council members vowed not to run for reelection. Junior Backman, the DMR Resource Coordinator for eastern Maine at that time, said of the whale issue, "It was just too much. The zone councils didn't have the authority

to do anything with the whale situation and it distracted them from what they could have done."

In the years that have followed, the zone councils have been called on to respond to a number of federal initiatives, corresponding to all of these federal initiatives came at a cost. It also resulted in the zone councils responding to pressures from the federal bureaucracy, and not their own constituents in the industry. This served to alienate them further from the rank and file fishermen.

In retrospect, federal intervention did have a positive result. It motivated large numbers of people to persist in their efforts to manage the fishery. Spurred on by the fear of draconian federal control, many remained involved in the zone management process long after they might have given up under ordinary circumstances: they volunteered to help monitor the whales; and the leadership of the industry increasingly devoted a good deal of time to the ASMFC process after 1997. As Larry Knapp, Chairman of the Zone E council remarked, "either we manage this resource or they [i.e. the feds] will do it for us. " As we shall see, by the year 2000, the activities of fishermen were to have a marked effect on the Federal and ASMFC management process.

A Behavioral Response to the Trap Limits

When trap limits began to be imposed in 1997 and 1998, many observers of the industry, including the author, predicted that the number of traps in use would quickly stabilize and then begin to drop. In fact, the total number of traps in use rose. Official state statistics (see Table 1.2 indicate that in 1994, the year before the trap limit went into effect, there were a total of 2,786,000 traps in use in Maine. For the next several years, the number in use increased, so that by 1999, there were 3,043,000 traps in the water (Table 1.2). Our 1998 survey showed that fishermen reported that they fished a mean number of 432.5 traps in 1990; 503.6 traps in 1995; 552.4 in 1997; and 571.1 in 1998.

Not all fishermen increased the number of traps they fished. The response was highly differential. However, the numbers who reduced the amount of traps fished are far outweighed by those who increased their numbers of traps. The result has been an overall increase in the number of traps in the state. As can be seen in Table 5.4 below, of the 1,055 lobster license holders interviewed on whom we have information, 616, or 58.4 percent, reported that they increased the number of traps they fished from 1995 to 1998; 260, or 24.6 percent, said they fished the same number of traps they fished the year previously; and 179, or 17 percent, said they actually fished fewer traps than they did in the past year.⁴

Table 5. 4 License holders changing the number of traps between 1995 and 1998

	Over 200 trap decrease	Decrease 1-199 traps	Same number of traps	Increase 1-199 traps	Over 200 trap increase
No. license holders	160	19	260	350	266
Percentage	15.2%	1.8%	24.6%	33.2%	25.2%

This means that if we want to understand changes in the number of traps in use, we must explain why different sets of fishermen decided to increase or decrease the number of traps used as they did. We will discuss the factors influencing men to decrease the numbers of traps they fished first, and then the variables influencing people to increase traps.

Factors Leading to a Decline in Trap Numbers

Three different factors influenced people to decrease the numbers of traps fished. These are relatively straightforward and easy to understand.

Trap Limit

There were a number of license-holders in the sample who reduced the number of traps they fished because of the trap limit. When the Zone Management Law went into effect in 1996, fishermen with over 1,200 traps were forced to begin to reduce the number of traps they fished in increments to meet the state mandated 1,200 trap limit. When the zone trap limits were announced in 1997 and 1998, more men had to begin to reduce the number of traps they fished. Still others, who favored a trap limit all along, reduced the number of traps they fished by attrition, in the certain knowledge that more severe limits were coming and that it was nothing short of foolish to buy more traps under these circumstances. These people were making the kind of choice many observers had assumed would be general in the industry.

Age and Illness

Some in our survey said they were reducing the number of traps they fished due to either age or illness. Some of them were entering retirement or semi-retirement and were reducing the number of traps they fished accordingly. Others said they had reduced due to illness or the illness of someone in their family. Those who are scaling down with retirement in mind will almost certainly not increase the number of traps they fish again. Younger men with injuries or illnesses are likely to increase the number of traps they fish once they recover.

Overcrowding and Shore-Based Job

Another set of respondents reduced the number of traps they fished either because they had to devote more time to a full-time job and/or because of severe trap overcrowding. A few of them were leaving fishing altogether to enter another business or go back to school. Others said

they were reducing the number of traps they fished since they were going back to "fishing singles" (i.e. fishing one trap on a line) as a means of coping with gear congestion. One man said, "I am getting a lot of overtime now [on his full time job] and haven't got as much time for lobstering as I used to. With all the tangles it takes me longer to pull my gear than it used to. When 50 traps wore out last fall, I didn't replace them."

Factors causing lobster license holders to increase the number of traps fished.

Three different factors caused fishermen to increase the numbers of traps fished, and they are less straight forward, more complicated, and more difficult to understand.

Catches, Income, and the Increase in Full-time Fishermen

One dominant factor causing the increase in traps was the economic opportunities presented by lobster fishing. Very high incomes could be earned in the industry which stemmed from record high catches and good ex-vessel prices. While no definitive study of lobster fishing incomes has been done recently, there are a number of reliable reports of lobster fishermen catching over 40,000 lbs of lobster and grossing over \$250,000 gross income in the mid 1990's. In our survey, 264 license-holders of the 1,083 on whom we have information, or 24.4 percent, said that they caught over 25,000 lbs of lobster in 1997. Since the average ex-vessel price per pound in that year was about \$3.75, it is reasonable to assume that these men grossed over \$93,750 during that year. Other estimates indicate that full-time fishermen with average-sized operations might gross \$65,000 and have a net income (after taxes and expenses) of \$40,000.

At the same time, conditions in other fisheries have been terrible. In Maine, catches of groundfish have plummeted in recent years, due primarily to over fishing (Murawski et. al 1997) which has resulted in a sharp reduction in numbers of boats and people employed in that fishery. Throughout the 1980's and 1990's, people switched from groundfishing into a variety of

alternative occupations.

As a result, a large number of people who had been part-time lobster fishermen (or were completely inactive in the fishery) became full time fishermen who used a lot more traps. Some of them had earned most of their income in shore-based jobs; others had been primarily in the groundfishery. When it became possible to earn high incomes in lobstering, these people gradually shifted their operations and devoted more months to lobster fishing and less time to other jobs. As a result, the total number of licenses did not increase appreciably in the last twenty years, but the number of fishermen whose primary target species is lobster has increased by leaps and bounds, particularly from 1990 to 2000.

The shift to full time lobstering is reflected in changes observed in the percentage of income earned in lobstering over the course of time. In a 1973 study of the lobster industry, it was estimated that "less than a third of the these licensed fishers could be considered full time" (Huq and Hasey: 1973:1; Acheson 1975a: 661). By the mid 1990's, the majority of lobster fishermen had become full-time lobster fishermen and earned very little of their income in other fisheries or in non fishing jobs. Our 1998 survey showed that in every zone over 50 percent of the license holders reported earning between 50 and 100 percent of their income from lobstering (see Table 5.5). Over 50 percent of the respondents said they earned no income in any other fishery; and over 50 percent said they earned nothing in any non-fishing job.

Table 5.5 Percentage of 1997 income reported as earned from lobstering, by zone

Income	Zone A		Zone B		Zone C		Zone D		Zone E		Zone F		Zone G		State	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
0	11	5.5	13	11.1	7	4.8	18	7.2	12	8.4	21	14.3	7	6.2	89	7.9

1-24	27	13.6	15	12.8	14	9.6	29	11.5	21	14.7	28	19.0	15	13.2	149	13.3
25-49	18	9.1	14	11.9	13	8.9	22	8.7	9	6.3	9	6.1	3	2.6	88	7.9
50-74	38	19.2	12	10.2	22	15.1	25	9.9	20	13.9	12	8.2	12	10.6	141	12.6
75-100	104	52.5	63	53.8	89	61.4	162	62.5	81	56.6	77	52.4	76	67.2	652	58.3
Total	198	100	117	100	145	100	256	100	143	100	147	100	113	100	1,119	100

As these people became more dependent on the lobster fishery, the number of traps they used increased. In the state as a whole, license-holders earning 75-100 percent of their income from the lobster fishery used an average of 732 traps, while those earning 50 to 74 percent of their income from lobstering used 535 traps, and those earning 25-49 percent of their income from the lobster fishery used only 311 traps on the average (Table 5.6). Clearly, the move from part-time to full-time status is accompanied by a great increase in the average number of traps used.

Table 5. 6 Average traps fished in 1997, by percentage of income from lobster fishing

% Income from lobstering	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	State Avg.
0%	32	71	53	34	11	37	25	38
1-24%	218	93	169	136	143	134	169	152
25-49%	302	313	381	276	337	232	333	311
50-74%	553	552	501	590	347	553	651	535
75-100%	735	569	674	844	584	929	790	732

Legislation and Uncertainty

In some part, the decisions of fishermen concerning the number of traps to fish was a response to a whole plethora of regulations and proposed regulations, and to uncertainty about what the future would bring. After 1995, federal, state and ASMFC regulations came so fast that

fishermen literally did not know from one month to another where they stood. Zone meetings became increasingly devoted to discussing ASMFC rules, NMFS plans, "whale take reduction" strategies, lawsuits, etc. The zone management councils began to react to events at the state and federal level, rather than solely reflecting the wishes of the fishermen in their respective zones. As one fisherman phrased the situation: "We are not sure who is going to be able to fish, where we will be able to fish, or how many traps we will be able to fish."

Many thought it was unlikely that they would be allowed to increase the number of traps they fished in the future, and responded by increasing the number of traps while they still could. These men felt they were "grand-fathering" themselves into the fishery. David Cousins, Maine Lobstermen's Association president, summarized the attitude of many of these men by saying, "Many guys figured it was now or never."

When we asked people why they had increased trap numbers, many were quite clear. One wrote *"Federal laws. We are afraid of what they might do;"* another simply commented, *"Over regulation."* Still a third put down *"To get the number of traps up. That when the feds, tree huggers, and all the other groups that know nothing about lobstering put us on a limit of some kind, hopefully they will leave me enough to make a living, where 100 percent of my living comes from lobstering."*

Additional comments from fishermen on this survey revealed that several events raised uncertainty: the federal level (i.e., the ASMFC-NMFS contest), the trap limit, limited entry proposals, and the Zone G lawsuit. The trap tag provision of the zone management law raised special anxieties. When the trap tag law was passed in 1995, the Commissioner promised that the trap tag data would never be the basis for limiting or freezing the number of tags fished. Many fishermen were very disbelieving, predicting that the government would use the trap tag

information to freeze the number of traps a person could fish, or that a required build-down in traps would be calibrated to the number of tags that a person had. Indeed, this came to pass. The draft NMFS plan, which did not come to fruition in 1999, had a provision that fishermen were to build down to 475 traps by ten percent per year from the number of traps they currently held. Moreover, the Lobster Advisory Council seriously discussed freezing traps according to the number of tags a person had in 1998. As a result, revealed wisdom among many in the industry has been that fishermen who increased the number of traps they are fishing or bought more trap tags than they are were using would be better off when the all-too-likely reduction in trap numbers was ordered.

Competition

Typically in open access fisheries, competition feeds on itself. This certainly occurred in the lobster fishery. Once some in a harbor increased the number of traps, others felt they were forced to follow suit or see the percentage of traps they had on the bottom decline, along with their incomes. Many were very reluctant to fish more gear, knowing that it would contribute to an already severe congestion problem, and would increase business costs. They also knew that a trap limit was coming and that they probably would have to reduce the numbers of traps they fished in the near future. However, when faced with the prospect of losing income to more aggressive fishers, they put more traps in the water to keep up with the competition.

Moreover, the competition was spurred by concerns with prestige. "Highliners", very successful fishers, receive a good deal of prestige in lobster fishing circles; and much approbation can be heaped on "poor" fishers (Acheson 1988: 48-59). Under these conditions, keeping up with the competition not only maintains income, but also one's social standing as well.

Reasons to Change Trap Numbers: A Summary of the Data

How important were these various factors in influencing the decisions of fishermen concerning the changes in trap numbers? This is difficult to say because the questionnaires and follow-up interviews revealed that many men were influenced by a number of variables. However, some indication of relative importance of these variables can be obtained from analyzing the answers to the survey question: "If you changed the number of traps you fished in the last five years, explain why you made these changes?" The answers received are summarized in Table 5.7 below.

Table 5. 7 Primary explanation for changing numbers of traps used

Reason offered⁵¹	Number of fishermen	Percentage of cases
Competition	130	11%
Uncertainty due to laws and government action	61	5%
Expanding business	161	14%
Increase income for investment (new boat, etc)	41	4%
Increase income for consumption (bills, college, house)	139	12%
Switching to lobstering from less desirable fishery	20	2%
Switching to lobstering from shore job (Increase)	31	3%
Decrease due to trap limit	47	4%
Decrease due to age or illness	77	7%
Decrease due to overcrowding, or switch to shore based job	72	6%
Fishing about the same number	199	17%

Reason offered^a	Number of fishermen	Percentage of cases
Other explanation or no explanation	158	14%
Total	1,145	100%

^a Some are reasons given for increasing the number of traps fished; others are reasons for decreasing trap numbers.

There were three reasons people gave for decreasing the numbers of traps fished: age or illness, the trap limit, and switch to a shore-based job. None of these factors motivated large numbers of fishermen, and all three of these appear to be of equal importance in motivating people to use fewer traps.

The responses to this question indicate that the most important factor influencing an increase in traps is an increase in economic opportunities in the lobster fishery brought about by high stocks sizes and record high catches. There was money to be earned in the lobster fishery, and people responded by putting more traps in the water to get higher catches and returns. They phrased the reasons for their actions in different terms. One hundred sixty one said they were "expanding [their] business;" another 139 said they were putting more traps in the water to get more income for "consumption purposes;" another 41 said they were expanding the number of traps they fished to get money for a "new investment" such as a boat. People who gave these three answers totaled 341, or 30 percent of the whole sample. Another 51 respondents, or four percent, responded by saying that they were moving into lobster fishing from other troubled fisheries or shore based jobs.

Keeping up the competition was the second most important reason given for increasing traps. One hundred and thirty or 11 percent gave this answer.

Sixty one license holders, or 5 percent of the total, responded that they increased the numbers of traps they fished due to the uncertainty brought about by regulation and government actions. The effect of actions of the government may be more important in motivating license holders to increase traps than these numbers alone would indicate. General concern with actions of the government was laced throughout the questionnaire responses. When fishermen were asked "What is the most serious problem facing the fishing industry, a very large number said "the feds, the government." In this period, fishermen were very concerned with positioning themselves for an uncertain future.

The fact that fishermen choose to increase the number of traps they fished in the face of a trap limit, it certainly counter intuitive. I was one of the many people who predicted that the number of traps fished would quickly decline when the trap limit was imposed. We were wrong. In retrospect, it is difficult to understand our lack of insight-particularly when all of the variables that have produced the increase in traps were present in 1995 when the lobster zone management law embodying the trap limit was passed.

Successes and Problems in Implementing the Co-Management Law

Successes and Problems

In the first five years, the co-management law has produced some notable successes; it has also resulted in a series of problems. These problems are being solved, but they are problems none the less.

On one level, there can be little question that the co-management effort in Maine has been successful. The law was framed in a way which permitted the zone councils and the fishermen in them to generate rules to constrain their own fishing effort. Within a year after the permanent zone councils began operation, all of the zones had passed trap limit referenda. Then the

industry, working through the Lobster Advisory Council, got the right to limit entry by zone. By December 2000, five zones had limited entry rules for their zones; and by 2001, the legislature had passed a law allowing Zone C to have an expanded apprenticeship program. This is unquestionably a success, especially in view of the fact that the Legislature has been unable to pass trap limits or limited entry legislation for the entire state for decades. Another measure of success is the fact that the zone councils and Lobster Advisory Council, working with the Department of Marine Resources, have been able to solve a whole series of problems.

These problems are of several different types. First and foremost is the fact that those involved in the zone management effort have had to solve a series of problems, each of which was caused by an attempt to solve a previous problem. In the words of one zone council member, "you solve one problem and five others crop up." All of these problems have stemmed from distributional issues caused by the legislation that was passed. Passage of trap limits resulted in altering the percentage of traps that full-time fishermen had on the bottom, as opposed to part-time fishermen. In order to stop the build up of traps by those in the industry and prevent newcomers from putting traps back in the water they had been forced to remove, the full-time fishermen successfully lobbied for limited entry by zone legislation, a the trap cap law, and Zone C got an expanded apprenticeship program. If limited entry were going to be effective, people from one zone would have to be prevented from placing "a majority of their traps in another zone," which prompted the DMR to put in the 49 percent/51 percent regulation. This brought about boundary disputes in every zone. An effort by Rep David Etnier to solve this problem by legislation failed in the spring of 2000. This means that the solution to these boundary problems has been left to the Commissioner of the DMR and the Zone Councils. By the fall of 2000, they have been able to settle satisfactorily only two of these disputes by imposing buffer zones between

Zones Band C, and D and E.

In this entire process, the conflict between full-time and part-time fishermen has been the most serious problem that has emerged since the passage of the Zone Management Law. Passage of the limited entry by zone and the trap cap has reduced the conflict and enmity for the time being. But the problem lies just below the surface, and will likely emerge in some other form in the near future. Boundaries have posed a volatile set of problems. The conflicts over the zone boundaries have been greatly exacerbated by the 49 percent/51 percent rule, which has inhibited the flow of fishermen over zone boundaries making it impossible for some fishermen in harbors adjacent to zone boundaries to be able to fish in part of their traditional fishing area. We have likely not heard the end of this problem either.

There are also serious boundary problems stemming from establishing the two conservation zones-particularly Monhegan. As was pointed out in Chapters 2 and 3, the conflict between Monhegan and Friendship was so severe that the Department of Marine Resources and Marine Resources Committee of the Legislature have sworn off establishing anymore conservation zones or any other kind of sub-zone. This is a decision that may come back to haunt them.

Another problem-one that some fishermen would say is very serious~is the fact that the trap limit has not stopped the build up of traps. In their view, the zone councils have put a lot of effort into establishing trap limits, which were supposed to have solved the problem of congestion and cut the number of traps. The fact that this has not occurred raised questions about the value of the co-management effort. That concern has little substance because the trap limits and limited entry rules have the stopped a massive expansion of people and traps into the industry that would have certainly occurred in their absence.

There are other kinds of problems that caused less severe problems for the co-management system. Two different kinds of legal issues have come to the fore due to the way the Zone Management Law has been implemented. The Zone G lawsuit was undertaken by a group of four fishermen who wanted to rescind the trap limit referenda passed in Zone G. An unclear passage in the Zone G constitution that was open to multiple interpretations gave them to legal ammunition they needed to win the suit and thwart the clear will of the majority of fishermen in the zone who voted overwhelmingly for the trap limits.

Communication between Zone Councils and districts is not as good as it should be, and it is difficult to imagine a change in rules that would ensure that the voices of district members are conveyed or taken into account by their elected representative.

Another major set of problems was caused by judicial and legal action at the federal level. The zone councils and the Lobster Advisory Council have no legal authority to influence in any way regulations passed at the federal level. However, the Commissioner of Marine Resources called on them to help marshal the support of the lobster industry behind the state's response plan to federal management initiatives. The coalition of the officials of the DMR and the industry working through the zone councils proved very effective in getting regulations the industry could live with. They were successful in getting the National Marine Fisheries Service to support the lobster management plan of the Atlantic States Marine Fisheries Commission, and to support the whale plan, which relied heavily on disentanglement teams composed of industry members. The cost of this intense lobbying and organizing activities was more acrimony, fatigue and burnout of zone council and Lobster Advisory Council members and chairs. It also alienated them more from ordinary fishermen.

The success of the co-management effort depends on fishermen being able to cooperate

and negotiate with other fishermen and bureaucrats. They have generally succeeded in this endeavor. But cooperation has been difficult to achieve because bureaucrats and fishermen live in two different sub-cultures, and because zones are made up of harbors that have long competed for fishing bottom.

Another kind of problem concerns the control over the co-management process. From the perspective of many fishermen, the zone management process involves far too much control by the Department of Marine Resources. There is much in this observation. The Lobster Advisory Council has accepted the agenda of the Commissioner as its own, and it has made all too few efforts to consider solving problems identified by the zone councils or the industry as a whole. Officials of the Department of Marine Resources have been promulgating regulations with next to no input from the zone councils or the Legislature. The most prominent of these are the 49 percent/51 percent rule and the rule that 18 year olds who complete an apprenticeship program can get a class I lobster license in any zone.

Moreover, the DMR is heavily involved in the operation of the co-management system. By law, the DMR must organize the hearings concerning limited entry proposals, qualify people for licenses, and certify that people have completed the apprenticeship program. But the zone councils have come to depend on the DMR staff to do a variety of other tasks that are not specified in any law or regulation. Terry Stockwell, the DMR Resource Coordinator, and his staff help make up agendas for council meetings, and they make sure they are sent to the newspaper and are posted on the DMR web page. They organize the elections to the zone councils, including sending out the ballots and counting the votes. They run the surveys that have become standard to send out before referendum votes. To be sure, Stockwell consults continually with the zone Council chairs. Even so, the Zone Councils have become so dependent on the Dmr staff that they

have probably lost more independence than they should have.

In 2000 the problem of too much state control was recognized and efforts were made to change the situation. The University of Maine Sea Grant program began to help the zone councils by providing secretarial services for the Council meetings. Having a good record of meetings and decisions will help the councils in the future. Moreover, George La Pointe, the Commissioner of Marine Resources is seeking ways to help the Lobster Advisory Council develop agenda items to respond to problems and requests of fishermen.

Criticism and the Threat of Political Action

Each of these different kinds of problems triggered criticism in one quarter and then another. When the Zone G lawsuit succeeded in overturning the trap limit vote in that zone, the entire Zone G council was so angry that it threatened to quit. Several of the boundary disputes, especially those between Zones D and E, between Zones F and G, and the Monhegan-Friendship dispute, were very bitter, and caused several good fishermen to say that the whole zone concept should be scrapped. After the whale controversy, which came at the same time that the councils were wrestling with trap limits, some of the council members became so burnt out that they vowed they would not run for office again. When trap limits were passed. In addition, a majority of harbors had a bunch of big fishermen who were bitterly opposed and blamed the part-timers who had the majority of votes in the elections. Some lobster fishermen are silent and stoical by nature, but others have honed the art of vociferous opposition and complaint to a high art form. It is called "crying" in the local parlance. At a large percentage of meetings and hearings, one or more of the dissatisfied would let go with a barrage of criticism. Criticism of all aspects of the zone management law was especially strident in eastern Maine, where it found voice in the statements and actions of officers of the Downeast Lobstermen's Association, whose members are

largely from Washington and Hancock counties.

The Marine Resources Committee heard more than its share of this criticism, and in 1999 they began to take it to heart. In November 1999, a meeting was held near DMR headquarters in Hallowell that was attended by several members of the Marine Resources Committee, the commissioner, George La Pointe, the ex-commissioner Robin Alden, the Presidents and executive Directors of the Maine Lobstermen's Association and Downeast Lobstermen's Association, members of the DMR staff concerned with lobster zone management, and a couple of academics, including the author. The topic under discussion was how to improve the zone management process, but in the course of the meeting it became clear that Senator Jill Goldthwaite, the Senate chair of the Marine Resources Committee, was questioning the wisdom of the whole co-management effort. She hinted that she was thinking of introducing legislation to nullify the whole zone management law. I suspect that she was just calling the bluff of certain people who had been very vocal in their criticism of the zone management law, but it is also possible that she was serious. If the latter is the case, then the zone management effort in Maine might have had a very short life.

Assessing Co-management: The View of Fishermen

Despite the problems and criticism, the lobster fishermen on the whole supported the co-management effort. Their assessment of the way the Zone Management Law was working is reflected in answers we received on our 1998 large scale survey.

The answers to many questions revealed a good deal of support for the zone process, even though the survey was being conducted within months of the time when the zone councils had passed trap limits over the vociferous opposition of many "big fishermen." The answers to other questions revealed what fishermen thought were problems with the system and what they hoped

the co-management would accomplish.

Table 5.8. Question: Were you in favor of the zone management concept when the Zone Management Law was passed in 1995?

	No	Yes	Total
Number	280	777	1057
%	26.5%	73.5%	100%

Table 5.9. Question: Overall how would you rate the zone management law?

	(very neg.)		(neutral)					(very pos.)		Total	
Rating	1	2	3	4	5	6	7	8	9	10	
No.	141	26	56	62	190	123	149	173	42	101	1063
%	13.3	2.5	5.3	5.8	17.9	11.6	14.0	16.3	4.0	9.5	100%

Note: Respondents were asked to rate on a 1-10 scale, with 1 being "very negative," 10 being "very positive, and 5 being "neutral." The mean rating was 5.8 (*s.d.* 2.68). The mean rating was 5.8 (*s.d.* 2.68), which is a mildly positive assessment for the respondents as a group. A better indication of their assessment of the Zone Management Law is the fact that 43.8 percent of the respondents gave the law a favorable rating (i.e. scores of 7,8,9,10), whereas only 26.9 percent gave it a negative rating (i.e. scores of 1,2,3 and 4). However, it should be noted that approximately 30 percent of the respondents had very strong feelings about the law. Some 15.8 percent gave it very negative ratings (i.e., ratings of 1 and 2); while 13.5 percent gave it very positive ratings. (i.e., ratings of 9 and 10).

Table 5.10 *Question: What is the most serious problem faced by the lobster industry?*

Coded answer	Number of respondents	% of responses
Too many fishermen	76	7
Too many traps	240	21
Over fishing	212	19
Lack of trap limit or correct trap limit	28	2
New entrants (draggersmen switching over)	39	3
Part-timer/full-timer controversy	66	6
Feds/gov't. bureaucracy	206	18
Other	276	24
Total	1,143	

These answers indicate that lobster fishermen regarded the most serious problem as too much gear in the water and too many fishermen (i.e., "too many traps," "over fishing," "too many fishermen," "new entrants"). There was also a concern with "Feds/bureaucracy," which, in many

cases, reflected frustration and a concern that their fate was in the hands of people who did not know much about the lobster or their industry. Smaller numbers saw the "part-timer/full timer" conflict as the paramount issue. This issue, of course, is tied up with the effort to get a trap limit.

Table 5.11 *Question: Are you in favor of the trap limit passed by referendum of the fishermen in your zone?*

Coded answer	Number of respondents	% of responses
Yes, no explanation	471	41
Yes, with additional suggested rule	182*	8
Yes, but not strict enough	32	4
No, no explanation	48	16
No, not strict enough	90	5
No, it only redistributes the traps	30	3
No, encourages buildup	24	3
No, we need limited entry too	11	2
Other responses	203	1
No response	54	18
Total	1,145	

These answers reflect overwhelming support of the trap limits, which reflects the votes in all of the zones. Of the 1,145 people who answered this question 685 or 60 percent said "yes" in one way or another, and only 203 or 18 percent were against the trap limit. But the support for the trap limit is even stronger than these figures would indicate, since 90 of the people who said "no" were in favor of a trap limit, but wanted a more stringent one than passed by their zone

referendum process.

Table 5.12 Question: What is the most important problem facing your zone management council at present?

Coded responses	Number of respondents	% of responses
Trap limit	146	11
Federal government	107	8
Lack of communication/cooperation	111	8
Over fishing	48	4
Licenses/license regulation	92	7
"Lack of concern for the future" "Greed" "Trap buildup"	128	10
Other responses	203	15
Don't know	61	5
No response	451	34
Total	1,347	

The answers to this question reveal a potpourri of concerns, ranging from actions the councils were considering or had undertaken, to the way the zone management system was operating. Some gave answers that reflected a concern with issues the councils were dealing with in the summer of 1998. Large numbers of people were concerned with curbing the trap escalation, which was the most important issue being dealt with in the summer of 1998. Some called on the councils to enact trap limits; others were concerned about the motivation behind the trap escalation (e.g., greed, etc.). Other said they wanted a "tiered" license system as a means to handle the so called "part-timer problem."

Still others recognized the problems that actions of agencies of the federal government were posing for the industry and the co management system. Many made specific reference to the whale controversy and the lobster plans put forth by the NMFS and the ASMFC. Many of these people wanted less intervention or no intervention by the federal government on ideological grounds, reflecting a growing feeling in the country that too much power is being concentrated in the hands of the central government. But some of these people had very serious and sensible misgivings about the specifics of the plans being put forth by the NMFS on both the whale issue and lobster management.

Others were concerned with the operational problems the councils were facing. In this category is a concern with communication between the fishermen, the zone councils and the DMR. This was clearly a way of saying that they did not feel they were being listened to by the zone councils and Lobster Advisory Council, whose attention was riveted on the threat of federal intervention.

The largest number of respondents did not answer the question. It is difficult to know how to interpret this. They may not have wanted to think about the problem, but it may also indicate that many respondents could not name a single all important problem facing the zone council.

Table 5.13 *Question: What is the solution to this problem?*

Coded responses	Number of respondents	% of responses
Trap limit or trap freeze	351	34
Limited entry	166	16
Tiered licenses based on income	73	7
Leave us alone	105	10
Other conservation rules(seasons, v-notch, increase measure, increase vent, etc.)	119	12
Other	329	32
Total	1,024	

As might be expected, the answers lobster license holders gave to this question were determined by what they identified as identified as the problem facing the zone councils. Those who saw the proliferation of traps as the problem, suggested trap limits as a solution. Those concerned with too "over fishing" or too many fishermen focused on the need for limited entry or tiered license solutions. The people identifying federal control as a problem wanted to be "left alone". The important point is that generally the respondents were not just aimlessly complaining and whining, they had an interest in the fishery and the co-management system, and they had a plethora of suggested solutions to the problems they had identified.

Table 5.14 *Question: Should the lobster zone management councils have additional authority? (If "Yes", explain what additional powers they should have.)*

Coded responses	Number of Respondents
No	723
No response	199
Yes, to curb power of Feds and the state	23
Yes, to give the fishermen more control	48
Yes, should have power enough to solve the problems they face	33
Yes, to control entry	51
Yes, other.	58
Total	1,145

Sixty four percent (723 out of 1,135) said "no." Some of these respondents were against the whole concept of local control. The vast majority favored co-management, but thought that the zone councils had all they could handle temporarily. One person said, "once the trap limit problem is settled, then we can think about expanding the powers of the zone councils." Another said, "They have enough on their plate to keep them busy for a while."

Those answering "yes" thought that the zone councils to be empowered to control entry into the industry and be able to handle a variety of other problems. Some were very much in favor of local control and wanted the councils to succeed so the federal government and state would have little excuse to exercise more control over their fishery.

The Future of Co-Management in the Lobster Industry

Cultures are very persistent. Once rules and values are established, they do not change easily. Bob Dow, who was Commissioner of Marine Resources in the 1950's applied this principle to the lobster industry by saying in an interview: "When a new law is proposed, fishermen are against it. Once it has been in existence for ten years, fishermen will fight anyone who wants to change it. " This underscores the idea that the co-management system is likely to be very vulnerable in the first decade or so of its existence. When it has become institutionalized, it will likely to be more impervious to change. The institutionalization process is likely to be helped along by the ASMFC, which has also endorsed zone management as well as Maine.

While it is impossible to see into the distant future, there are some issues and questions that will need to be faced in the near future that have profound implications for the way the co-management system in Maine will evolve.

First, the tension between full-time and part time fishermen will also have to be addressed. Large numbers of full-time fishermen feel seriously disadvantaged by the system because they can be outvoted by the part-timers. A tiered license system, which has been discussed by the Lobster Advisory Council on several occasions, could help to alleviate some of the fears of the full-time fishermen. But a licensing system in which part-time fishermen got a smaller number of traps and a partial vote might also alienate numbers of part-time fishermen and raise constitutional questions.

Second, boundary problems have proven to be very severe and more intractable than anyone thought when the zone management law was proposed. It is beginning to appear that several of these will only be solved by forceful, top down management by the Commissioner.

Third, is trap escalation. The primary reason the Legislature passed the zone management law and the industry came to support it was the fact that it promised a way to produce trap limits, which, in turn would lead to a reduction in traps. The trap limits have not led to a quick reduction in numbers of traps used, and this had led a minority of fishermen to question the value of the whole co-management concept. If the numbers of traps continue to escalate along historical trend lines, the result could be a substantial unraveling of support for the law. In fact, trap numbers could climb in the immediate future. After all, in 1998, half of the license-holders were part-time fishermen (See Table 5.3). If a substantial number of these become full-time fisherman, trap numbers would go up.

I predict that the number of traps will fall some time in the future. After all, the response of the industry to the increase in traps was to lobby [successfully] for a limited entry law. The combination of the trap limit and limited entry will almost certainly bring a reduction in the number of traps in time. It is difficult to imagine how numbers of traps can continue to climb in the long run (Table 1.2) when the number of traps is capped at 600 or 800 and the numbers of licenses will decline. Moreover, even in the short run, these rules have almost certainly had an effect. Were it not for the trap limits and the moratorium on licenses, the boom in the lobster industry would almost certainly have attracted additional fishermen and motivated established fishermen to buy ever-increasing numbers of traps. As Terry Stockwell phrased the situation in 2001, "Lobster fishing has been phenomenal. I would hate to see how many traps we would have had in the water now had we not got started on trap limits in 1995. "

Fourth, is the proper role of the governance units in the co-management process? What rights should the councils have? How much time should be allocated to various tasks and

processes? When should the commissioner be able to act unilaterally to promulgate rules for the co-management system? Under what conditions should the Legislature be involved? Co-management, as the name suggests, indicates a system of shared governance in which all parties have duties and responsibilities? Those have not been specified well enough, and are still in the process of evolving.

Some functions are clearly best left to the government. Enforcement is one of these. No one has suggested that law enforcement be left to the industry. There are always costs to sanctioning others. Maine fishermen know it is best to foist the costs of law enforcement onto officers of the government, and the same is true of fishermen of other societies. (E.g. see Taylor (1987: 304).

The councils also need some technical and logistical support. With that in mind, Robin Alden created within the bureaucracy positions for two full-time resource coordinators to work with the zone councils. She appointed two experienced fishermen, Junior Bachnan and Terry Stockwell, to these jobs, and they proved to be especially effective in running elections, doing surveys, and facilitating communication between the state bureaucracy and the lobster industry. But the creation of such intermediaries had some serious drawbacks. In the first year after they were appointed, the coordinators became indispensable to the councils and their operations. Some observers felt that they did so much that they and the department were forcing the zone councils to act as units in a top down management process. But could the councils have operated without the resources of the DMR? It is very doubtful in my opinion..

It would be possible to hire staff members for the councils (independent of the DMR), or have other firms or agencies do some of the surveys and elections for the councils. This would likely increase independence from the state bureaucracy, but it would also likely increase work

for the council chairs, and lead to problems of continuity when the council members rotated. Then there is the matter of money to finance such services. In Maine, this is often the deciding factor.

A closely related issue is concerns the amount of power the Commissioner of the DMR should have to promulgate regulations affecting the co-management process without the zone councils or the Lobster Advisory Council ratifying them. Many problems might have been avoided if the zone councils and LAC had a chance to discuss the implications of the 49/51% rule and 18 year old license rule before they went into effect.. But it is also clear that the Commissioner needs some authority to promulgate rules, especially in cases in which the Councils and LAC are unable to solve problems. A good case in point are the boundary disputes that have dragged on for years.

What is the future of the Maine co-management effort? To a large extent, the answer to this question depends on the activities of government at several different levels. If there is anything we have learned about co-management in general, it is that lack of support by government agencies can be the death knell of such programs (Jentoft 1989). I have no doubt that the Lobster Zone Management Law would not have passed through the legislative process had it not been for the support of Commissioner Robin Alden. There can also be little doubt that an unsympathetic commissioner with good bureaucratic skills could have killed such a program, especially in the early stages before it has become institutionalized. Such a commissioner would find ample ammunition in the enabling legislation and the Maine APA (The Administrative Procedures Act), which gives virtually all power for rule making to top state administrators.

In 1997-98, federal intervention could have dealt the zone management process a mortal blow. There would have been little sense in the councils going through all of the *sturm und drang* of establishing 600 and 800 trap limits for the zones, only to have the National Marine Fisheries

Service dictate trap limits of 475 for the fishery as a whole. When Zone E was wrestling with trap limits, and its council members were garnering in good deal of criticism for their efforts, one council member remarked "If the feds are going to force a 475 trap limit on us, all we have done is create a lot of enemies among the neighbors".

A larger problem is the structure of government and its relationship to co-management units. Is the government structured in a way to encourage co-management? Co-management systems are polycentric systems. They are composed of "many centers of decision making which are formally independent of each other"(V. Ostrom 1999: 52). If such systems are to operate, the larger and more powerful governance structures must be constrained from interfering with and overwhelming lower level structures (Ferejohn and Weingast 1997: 27). There is a good deal of evidence that externally imposed rules tend to "crowd out" endogenous cooperative behavior (Ostrom 2000a; Ostrom 2000b). Usually the independence of various government units is maintained by some kind of constitutional provision allocating power to various governance units and by providing "vetoing capabilities"(V. Ostrom 1999: 64).

Can the co-management system of Maine retain enough independence to continue? Neither the structure of state government nor federal legislation give us cause for much optimism. Neither does much to facilitate bottoms up management. The structure of the Maine government makes it possible-even mandatory—for the DMR to exert a good deal of control over the zone councils. The zone councils can only recommend rules to the commissioner, and then only in a very restricted sphere. Only the Commissioner of the Department of Marine Resources can make these recommendations of the councils into enforceable regulations. These laws are congruent with the Administrative Practices Act of the State of Maine, which centralizes the decision-making authority for all state departments in the hands of the commissioner of that department.

There is no provision in state law for a commissioner to delegate any authority. The "reasonable clause" of the Administrative Practices Act makes it possible for the Commissioner to change any rule suggested by the Zone Councils if he or she does not deem them "reasonable." In addition, all of the money to run the councils comes from the state, and is funneled through the Department of Marine Resources. As Ferejohn and Weingast point out (1997: 12), control over the purse strings leads inevitably to political control. This suggests that the Administrative Practices Act will likely need to be modified, and that the zone councils should control their own funds if co-management in Maine is to achieve its full potential.

Even worse, if the state government is not supportive of co-management, federal legislation is antithetical to it. Federal legislation is leading in exactly the opposite direction it should be going if we want to develop co-management systems. Since the 1970's the federal government has enacted a number of laws which influence fisheries management or restrict the freedom of fishermen to operate, including the Marine Mammal Act, the Endangered Species Act, the Fisheries Conservation and Management Act, and the recent Sustainable Fisheries Act. All of these laws give federal agencies a high degree of authority to enforce laws impinging on the fishing industry. There is nothing in the law to protect the zone councils or the Lobster Advisory Council from encroachment by these agencies (i.e., veto power), nor is there any way of constraining federal agencies. We are in the process-especially at the federal level-of creating a highly centralized management system, one capable of unrestrained top down management. These laws strongly shift the decision-making authority from the industry to people who have little direct knowledge of fishing, such as federal bureaucrats, judges, conservationists, and scientists. The capacity of these people to undermine the zone councils and their authority is very great indeed.

Another, and perhaps more serious, threat to co-management is presented by the attitudes of the fishermen themselves. The future success of the co-management system will necessitate the continued support of the industry and the willingness of fishermen to sacrifice. Should that support flag, the co-management system could quickly die. Lack of support could stem from many sources. Running the co-management organization imposes high costs on chairs and council members in the form of time spent at meetings, responding to constituents, and sacrifice of income and time with one's family. Then there are the psychic costs imposed by the long negotiations and acrimony that occur when people attempt to generate rules to constrain exploitive behavior. Such costs can devastate local level management efforts. In the past two years, there have been a number of zone council meetings and Lobster Advisory Council meetings that could not proceed because a quorum was not present. Some individuals have served one term on a zone councils and have refused to run for a second term. The number of fishermen who take the time to come to council meetings is always very small. Many fishermen do not know what their zone councils are doing, and do not seem to care much. In this sense, of course, the co-management system suffers from the same problem that plagues most democracies. Most of the work is done by a small percentage of the total population.

A deeper problem is the willingness of fishermen to accept and utilize power. In the past five years it has become apparent that a number of fishermen are solidly against the whole co-management effort. Table 5.6 shows that 26.5 percent of the fishermen were against the whole concept of co-management before the law was passed; and 15 percent thought the zone councils were doing a very bad job after the law was implemented. To be sure, they are a minority, but their existence is troubling. Interviews with these people reveal that many are against government in general. Some of the older fishermen dream for the golden age of the 1950's and

1960's when there was minimal government control over fishing. Others rationalize their unwillingness to cooperate in the self management effort in terms of an ideology emphasizing "independence ". I suspect that they are the counterparts of the Nova Scotia fishermen who refuse to support cooperatives and fishermen's organizations due to an ideology of "rugged individualism " (Jentoft and Davis 2000).

Others seem to expect the government to tell them what to do. Many of these people, I suspect, long for a structured world and the security that comes from responding to authority. The military and large bureaucracies are full of such people. A world in which you have to make your own decisions is less certain, less secure. Freedom is empty; it provides no goals. One fishermen said "I'll obey the law and the governor, but not these guys " (i.e., the zone council). The idea that fishermen on the zone council could make the rules he apparently found disquieting.

Academics interested in co-management need to do more research on those who oppose self governance. A good place to begin is the extensive literature on people who fit badly in democratic societies. A generation ago, several social scientists (i.e. Fromm 1941; Hoffer 1951) pointed out there are people for whom democratic government is directionless, lonesome, chaotic and leads to nothing of value. They long for certainty. These people are putty in the hands of charismatic demagogues. Their tendency is to undermine institutions like co-management structures.

Theoretical Issues Concerning Co-management

Several different kinds of problems have been encountered in implementing the Maine Lobster Zone Management Law. Some of those could have been predicted given the literature on co-management; other problems appear to be unique to the Maine situation and would not have been predicted by the literature.

Problems Foreseen in the Co-Management Literature

In the literature on co-management, there are said to be four obstacles to successful co management governance structures. (1) Co-management, it is said, can result in substantial conflict between groups of fishers (McCay 1988: 334; Smith 1988: 134). (2) Co-management regimes can fail due to opposition by government officials (McGoodwin 1990: 192-93). (3) Co-management organizations can be ineffective if they are given too little authority (Jentoft 1989), or do not receive technical help from government agencies with which they are supposed to coordinate. (4) Co management efforts can fail, if fishers who have been competitors fail to work together in a common cause (McCay 1988: 334-335).

Let us take these issues in order.

Co-management can cause conflict. First, there can be no doubt that implementing the co-management law has involved conflict. But the term "conflict" scarcely cuts to the essence of the issues in lobster management, nor does it describes what has occurred in the lobster fishery as the zone management process unfolded. There are several different kinds of conflicts involving different parties and issues. More important, in each case, conflict is a mechanism by which people attempt to get rules in their benefit. Last, attempts to solve a problem at one level have cause another kind of conflict at another level, demanding still another solution.

Since their inception, the zone councils have been involved in three different kinds of conflict. First is conflict between those with large number of traps, and those with smaller numbers over the imposition of a trap limit. Second, there were boundary conflicts over sub-zones and zone boundaries. Last, federal intervention involved the zone councils in two different conflicts with an unusual cast of allies and enemies. Efforts to protect the right whale under the endangered species act pitted the National Marine Fisheries service against the state of Maine and

its lobster fishermen. Moreover, the threat of the National Marine Fisheries service to preempt the lobster management plan of the ASMFC involved the zone councils in still another conflict. This conflict saw the lobster industry and the zone councils allied with the government of Maine and the ASMFC against the National Marine Fisheries Service.

In all of these cases, the politics of co-management in Maine has been dominated by distributional issues. Rules are rarely neutral. They tend to favor some people over others. People are fully aware of this, and attempt to frame laws and regulations in ways that favor them. Jack Knight (1992) convincingly argues that most norms and laws are developed as a result of conflict over the distribution of resources. The evidence suggests that the development of rules concerning conservation and the management of the zones has been dominated more by a concern for who gets the lobsters than conservation of the resource. These distribution fights can involve long negotiations or several different episodes in which one faction gets an advantageous rule and then another faction counters with a political effort to get another type of rule.

The whole trap limit and limited entry effort has been dominated by distributional concerns. Trap limits are rules designed to constrain "big fishermen" imposed by the vote of large numbers of license holders with moderate and small gangs of traps in order to increase the percentage of traps they have on the bottom. The big fishermen fought back, first with lawsuits (i.e. Zone G.), and then with legislation freezing trap tags and a law making it possible to impose limited entry by zone. These laws are designed to prevent small fishermen from increasing the numbers of traps they fish, and to slow entry into the industry. Both are designed to help ease the burden felt by big fishermen who have seen their incomes erode in the face of trap limits.

The attempts to establish conservation zones and (i.e. Monhegan-Friendship battle) and zone boundary issues are clearly distributional issues at heart. What is at stake is protected access

to more and better lobster bottom. Being able to fish without limits on both sides of a zone boundary (in contradiction to the rules), moving zone boundaries, and being able to establish a sub-zone with limited entry provisions are strategies designed to gain special access to lobsters at the expense of others.

In these distributional fights, established rules can be used strategically to get still other kinds of rules. For example, sloppily stated sections of Zone G's own constitution were used as the basis for a suit to set aside a trap limit in Zone G favored by most fishermen in that zone. Zone boundary lines are fresh ammunition in the hands of those who want to increase access to lobsters.

Co-management regimes can fail due to opposition by government officials.

Co-management organizations can be ineffective if they are given too little authority (Jentoft 1989) or do not receive technical help from government agencies with which they are supposed to coordinate

These assertions, I believe, hold true in the Maine lobster case. I have no doubt that the Lobster Zone Management Law would not have passed through the legislative process had it not been for the support of Commissioner Robin Alden and key members of the Marine Resources Committee of the Legislature. There can also be little doubt that an unsympathetic commissioner with good bureaucratic skills could kill such a program, especially in the early stages before it has become institutionalized.

The DMR also provides the services of the Resource coordinator(s), who quickly became indispensable to the Councils. The DMR has also assumed the onerous job of enforcing rules generated in the zone management process (i.e. limited entry, trap limits), and the Commissioner has stepped in to solve certain intractable problems. If the DMR had not provided such services,,

it is likely the co-management effort would have failed.

There can be little doubt that the direction of Maine lobster zone councils was strongly influenced by actions of the federal government. Within the first year of their existence, the permanent zone councils were asked to deal with the ASMFC plan, the threat of a restrictive NMFS plan, and the whale issue. Some important decisions of the zone councils, especially concerning the trap limits, were influenced by management plans being developed by the ASMFC and the NMFS.

Federal intervention could have dealt the zone management process a mortal blow. There would have been little sense in the councils going through all of the *sturm und drang* of establishing 600 and 800 trap limits for the zones, only to have the National Marine Fisheries Service dictate trap limits of 475 for the fishery as a whole.

The future of the Maine co-management effort will not be determined solely by actions of the lobster industry or the Maine government. Actions at the federal level will undoubtedly play a very important role in influencing the zone councils in the future.

Co management efforts can fail, if fishers who have been competitors fail to work together in a common cause.

The zone councils are composed of members from communities with a history of territorial conflict, and no cooperative tradition. Nevertheless, this has not posed undue difficulties for the councils. People have been able to overcome such barriers to accomplish the council's business.

Problems not Foreseen in the Co-Management Literature

In the literature on co-management, there is little mention of three issues that have posed major problems for the lobster zone management process in Maine. (1) Major conflicts have

arisen over boundaries. If we can judge by the Maine lobster case, co management governance structures will have to wrestle with boundary issues. Boundaries are both a necessary good and a source of problems. Rules cannot be applied in general; they can only be enforced within a given area. Boundaries are inevitable. However, the imposition of boundaries with one set of rules on one side and another on the other side inevitably causes enforcement problems and administrative costs. Bureaucrats, enforcement officers and fishermen hate boundaries, and with good reason. Is the solution to the problem to have as few boundaries as possible? Large zones will minimize administrative costs, all other factors remaining equal. However, small zones have the virtue of making it easier for fishermen to monitor each other's behavior, which is likely to result in smaller enforcement costs, and to enhance a sense of stewardship for the resource (Coleman 1990). The size of management areas and the number of boundaries is likely to remain a central and tricky issue for those designing co-management governance structures.

Second, it takes an enormous amount of time, effort and cooperation to make co-management work. In Maine a good deal of time has had to be devoted to overcoming the barriers to effective communication between people from different towns within zones. The fact that council chairs and members have had to play a particularly complex and confusing role as intermediaries between two different sub-cultures has added to their burdens. Dealing with complex federal initiatives has taken an immense amount of time. Some council members and chairs are feeling overwhelmed and burnt out.

Third, generating a rule to solve one problem leads to other problems, which necessitate further action. Solving the problem of trap congestion and run away costs with a trap limit caused the "big fishermen" to support limited entry by zone. Imposition of limited entry brought about the 49%/51% rule, which intensified zone boundary disputes. No doubt attempts to solve this

problem will cause others.

In conclusion, there can be little doubt that the co-management effort in the Maine lobster industry has had a high degree of success so far. By the fall of 2001, all of the zones have passed trap limit referenda, and that five four of the seven zones have recommended limited entiy regulations while another (Zone C) has successfully lobbied for a law allowing it to control entry into their zone with an expanded apprenticeship program. All of these rules demonstrates that under certain conditions users of resources can and genrate governance structures to constrain their own effort for the common good. Another measure of success is that the organizations charged with co-management in Maine have encountered a number of problems, and they have moved very effectively to solve most of them.

Endnotes

1. The Maine Fisherman's Forum is a unique institution. Since 1972, fishermen, bureaucrats, representatives of companies serving the fishing industry, and a few academics and politicians meet in Rockport and participate in four days of sessions on various topics of interest to the fishing industry. The forum makes Maine the only state in which there is an ongoing discussion of fisheries policy issues. It is attended by a serious group of people.

Ann: add in bibliography Jentoft, Svein and Anthony Davis. "Self and Sacrifice: an Investigation of small boat fisher Individualism and Its implication for Producer cooperatives."

[Http://www.stfx.ca/people/gbayesp/selfsacrifice_report.ht](http://www.stfx.ca/people/gbayesp/selfsacrifice_report.ht).

Last worked on Friday January 26, 2001 Edited by Ann 2/8/01. Bibliog checked 2/10/01

Bib corrected 4/24/01, 4/27/01

Chapter 6

Dealing With the Feds

The Coming of Federal Control

From the founding of the Republic to the 1970's fisheries management was completely in the hands of the states. The federal government had no regulatory control over fisheries. Two laws were to change this situation. Both were to have profound implications for lobster management. The first was the formation of the Atlantic States Marine Fisheries Commission (ASMFC), which was created by an act of Congress in 1942 and ratified by Maine in 1959 (12 M.R.S.A. Sec 4601-4613, 4651-4656.) in 1942. The ASMFC is an interstate compact of 15 states designed to assist in managing shared coastal fisheries resources of the eastern seaboard states. The authority of the ASMFC was greatly enhanced by passage of Atlantic Coastal Fisheries Cooperative Management Act in 1993.

The other was the passage of Public Law 94-265, The Fisheries Conservation and Management Act of 1976 (FCMA). In the 1970's this law was, popularly called the "200 Mile Limit Bill", because it extended U.S. jurisdiction out to 200 miles (Maine Commercial Fisheries 1976: 1A).

The ASMFC developed one bureaucracy to manage fisheries; passage of the FCMA resulted in the development of another, the Regional Council system. Some fisheries are managed by one; some by the others. Compounding the complexity is the fact that the National Marine Fisheries Service not only does the stock assessments for both, but maintains some

control over the management plans promulgated by both.

Management of the lobster fishery in Federal waters has alternated between control by the ASMFC and various agencies of the Federal government. Until 1977, the fishery was managed by the State Federal program, which was essentially ASMFC management. From 1977 until 1995, the fishery was managed by the New England Regional Council; from 1995 to the present, control passed back to the ASMFC.

This chapter will be devoted to understanding the politics of management under these various regimes, the management programs, and the were put in place or blocked. In chapter 7, the politics of science will be discussed. It is, however, difficult to separate these two topics because recommendations by scientists have influenced the actions of the regulatory agencies, and the activities of the agencies, always under pressure from the industry, have influenced the scientific agenda.

The State Federal Program.

The Federal State program began in 1972 and involved a coordinated program between the Interstate Fishery Management Program of the Atlantic States Marine Fisheries Commission (ASMFC) and the State-Federal Program of the National Marine Fisheries Service. The State-Federal Program lasted only until 1976 when authority for lobster management in federal waters was given to the New England Regional Council.

The first rules proposed by the State-Federal program seemed relatively innocuous. They called for all of the lobster-producing states to have uniform rules for lobster, including a uniform size of at least 3 3/16, prohibitions on landing egg-bearing lobsters or lobster meat and parts of lobsters. The National Marine Fisheries Service and many of the representatives of the

state agencies were in favor of uniform laws to simplify regulations and to aid enforcement efforts. These proposals caused little consternation in Maine, primarily because all of the proposed rules were already encoded in Maine law. Moreover, the Maine lobster industry was certainly in favor of other states having to raise their legal minimum measure because this would put Maine on an equal footing in competing for the so called chicken lobster market, small, cheap lobsters preferred by many, a part of the market that had been dominated by other states such as New Hampshire and Rhode Island with smaller minimum size restrictions. In short, the leadership of the Maine industry supported the goals of the State-Federal Program primarily because they recognized that the Feds might be able to accomplish what no one in Maine could, namely get these other state legislatures to pass laws raising the legal minimum size. Vinyl Look, who was Commissioner of Marine Resources in 1977, "stressed that what Maine would really like to see is a uniform minimum carapace length implemented by all the states" (Donnell 1977: 28).

The State-Federal program encountered little opposition among lobster fishermen. In the early 1970's when Federal intervention in lobster management began, the offshore lobster fishery was relatively small. Most fishermen exploited state waters most of the time where they caught most of their catches. It was only in the winter months, when lobsters migrated offshore, that any numbers of Maine fishermen fished in the EEZ, and the vast majority of these men only ventured five to ten miles outside state territorial waters. Moreover, few if any lobster fishermen even applied for the newly required permit to fish in Federal waters, since Federal and state authorities did not enforce the Federal licensing requirements.

If the rank and file lobster fishermen was indifferent to the coming of the Feds, the

leadership of the industry tacitly welcomed Federal intervention since it was considered economically advantageous to the industry. Unfortunately, the State-Federal program was not successful. From 1972 to 1976, the officials of the State-Federal program worked diligently to have the precepts of their lobster plan adopted by the states. Since they had no authority to promulgate regulations, the success of the plan depended completely on their ability to persuade the state legislatures to adopt it. They had little success in getting all of the lobster-producing states to adopt these measures. The primary problem, as might be expected, was opposition to the 3 1/16 minimum size rule in those states with a lower size limit. These had long had a monopoly on the market for small lobsters, and raising the minimum measure, they knew, would mean sharing the "chicken market" with states with larger measures. However, the fact that states such as Maine had supported the State-Federal program was to mark the beginning of a dangerous slide into Federal management in the lobster industry.

Management under the New England Regional Council

With the failure of the State-Federal program initiatives, Lobster management was given to the bureaucracy set up by the passage of the Fisheries Conservation and Management Act of 1976. (FCMA), where it remained until 1995.

The FCMA established eight regional councils charged with managing the fisheries in their zones. These councils are composed of the regional director of the National Marine Fisheries Service, the head of the fisheries agencies of the states in the council area, and three members appointed by each of the governors of those states. These councils are responsible for preparing fisheries management plans for all fisheries in their jurisdiction, and making recommendations for managing these fisheries to the Secretary of Commerce. If the Secretary of

Commerce accepts these plans, they are administered and enforced by the National Marine Fisheries Service. The fisheries from Maine to New York are in the jurisdiction of the New England Regional Fisheries Management Council (PI 94-265)..

Under the FCMA, the fisheries in territorial waters within three nautical miles from shore are in the jurisdiction of the coastal states. Those from the three mile line to the 200 mile line are in the Exclusive Economic Zone (EEZ), which is in the jurisdiction of the Federal Government. In reality, the situation is by no means that simple. On most issues, the Federal agencies and the states coordinate activities to avoid promulgating one set of regulations for territorial waters and another for the EEZ. The state fisheries agencies, regional council, NMFS, and ASMFC try to coordinate to produce one set of rules for a fishery. Moreover, there is an attempt to make a single agency primarily responsible for a fishery depending on the location of that fishery. Fisheries largely carried out within the territorial waters of a state are controlled in great part by the states or the ASMFC. Those done primarily in the EEZ are largely administered by the Regional Council and the NMFS. Complicating this picture is the fact that Federal government has the right to preempt the management powers of the states in cases where the management efforts of the states are judged inadequate. As we shall see, this has allowed the Feds to intervene in fisheries management decisions in the lobster fishery, even after primary jurisdiction was granted to the states and ASMFC. The FCMA puts the NMFS in an awkward and anomalous position. Management plans for species must be developed by the Regional Council. The NMFS can encourage the councils, or threaten them, but it cannot directly develop plans itself until the council has demonstrated its ineptitude. In other regions of the U.S., this system seems to have worked reasonably well. It has not worked well in New England, and the history

of lobster management and the New England Regional Fisheries Management Council is a primary case in point.

During the 1970's, the Maine fishing industry had few problems with Federal involvement in their fishery. If anything, they welcomed the intervention of the Feds. The FCMA was passed by the U.S. Congress largely in response to pressure from the U.S. fishing industry, which wanted the Federal government to control the activities of foreign fleets with large factory ships that had appeared off American shores in the 1960's and 1970's severely damaging stocks of fish in international waters that had been historically fished by the American fleet. What the fishing industry did not fully appreciate was that this law gave the government of the United States the power to regulate all fishing within 200 miles of the United States- including the domestic industry. They were soon to learn (Dewar 1983).

When the State-Federal program ended, authority for lobster management was transferred to the Council system established under the FCMA. The job of developing a lobster plan was given to the Mid Atlantic and New England Regional Councils, which worked very closely with the scientists and bureaucrats of the National Marine Fisheries Service and the states. Tom Morrissey of the National Marine Fisheries Service was in charge of the committee charged with developing the plan, which included both state and Federal scientists (Donnell 1977: 28A). The plan which evolved contained all of the provisions of the older State-Federal plan (i.e., prohibitions on landing lobster meat, lobster parts, and egg-bearing females). It also included several other provisions, including a rise in the minimum measure to 3.5 inches, abolishing the oversize and V-notch programs, and implementing a limited entry program. These latter proposals were to cause a major political battle when it was attempted to implement them.

At first the representatives of the NMFS, the Maine Department of Marine Resources, and the political leadership of the Maine Lobster industry all supported the plan and the need for effective management. Tom Morrissey, the leader of the team developing the plan, pointed out that developing such a plan was necessary to be in compliance with the FCMA or "200 mile limit law." Maine Department of Marine Resources Research Director Vaughn Anthony believed passage of the rules contained in the plan would help prevent a disastrous decline in the fishery, which he predicted as imminent. Eddie Blackmore, President of the Maine Lobstermen's Association, and other leaders of the industry strongly supported the need for a plan (Maine Commercial Fisheries 1978a: 12A). The leadership of the industry also initially supported the need to raise the minimum measure beyond 3 1/16 inches (Blackmore 1978: 3), and this became a key feature of the draft plan (Billings 1978: 1A). However, trouble loomed on the horizon when a survey of the membership of the industry associations showed little support for important parts of the plan. Ninety percent of the members of the Maine Lobstermen's Association supported the current double gauge law, indicating that they did not support abolishing the oversize law (5 inch maximum) or raising the minimum measure to 3.5 inches; the Atlantic Offshore Fish and Lobster Association wanted an economic study done before any change in the legal measures was contemplated (Maine Commercial Fisheries 1978b: 20). After this, the leadership of the industry backed away from supporting the State-Federal lobster plan.

When it became apparent that the Regional Council plan was solidly opposed by the industry, one group after another entered the fray with proposals for a whole series of different plans. The Maine Lobstermen's Association proposed a plan featuring a 500 trap limit (600 in boats with sternmen), and limiting entry through implementation of an apprenticeship program

(Morrison 1979: 23); Spencer Appolonio, the Commissioner of the DMR proposed a plan based primarily on raising the minimum measure that would not involve either limited entry or a trap limit (Larkin 1979: 4). Maine Rep. Pat Jackson sponsored a bill to set up a license system in which each license class would have a different trap limit. Rep. George Vincent proposed a bill implementing the length recommendations of the State-Federal Plan (abolishing the 5 inch measure and increasing the minimum size to 3.5 inches. Both of these bills were withdrawn. (Connolly 1979: 22). None of these plans had enough political support to be enacted into law.

The Blackmore Compromise: A Most Unlikely Episode

Throughout the early 1980's, the New England Regional Council pressed ahead with the State-Federal lobster plan. They were supported by the National Marine Fisheries Service and generally had the support of the state fisheries administrators and scientists, who urged legislators to adopt the ten points in the plan (Donnell 1977: 28A). Increasingly, however, they were opposed by industry.

At the root of this dispute lay a profound difference of opinion about the state of the lobster stocks, what controlled those stocks, and the proper course of management. Basically the consensus among state and Federal biologists is that continually escalating fishing effort had endangered the stocks. Not only were the size of lobsters small (growth overfishing), but there were not enough lobsters surviving to a size where they could produce eggs. These biologists point out that at least 90% of all lobster are caught in the first year after they molt into legal size when they are between 81mm and 92 mm on the carapace. Only 6% of the females are sexually mature at 81mm when they can be legally caught, which means that over 90% of the lobsters do not survive to produce eggs even once. By the time they are 98mm on the carapace, virtually all

of the females can extrude eggs. Since the early 1970s, following the work of Thomas and Krouse, the lobster scientists working for the NMFS and the states generally supported raising the minimum measure to 3.5 inches (88.9mm) a size at which 60% of the lobsters could extrude eggs. From that time on, raising the legal minimum size to 3.5 inches became the Holy Grail for these biologists (Acheson and Reidman 1982: 1-2; Krouse 1972; Thomas 1973a, 1973b). It was a goal whose virtues they preached incessantly. A recommendation to increase the measure to 3.5 inches was incorporated in the Comprehensive Management Plan for American Lobster produced by the Northeast Marine Fisheries Board (Billings 1978). Biologists and administrators have argued that Maine should do away with its oversize measure and the V-notch, and that these rules should not be promulgated in other states. The oversize measure, they argue, does little to conserve the large reproductive-size lobsters, since virtually no lobsters survive to this size. The V-notch is a source of infection, and they held that "there was a lack of concrete data to support the value of the measure" (Jones 1985b: 39). Moreover, only Maine has these two laws, and abolishing them would help the cause of obtaining uniform regulations.

A large segment of the lobster fishing industry viewed these recommendations as unnecessary, costly, and not in the best interests of conservation. Maine Lobstermen's Association President Eddie Blackmore's assessment of the situation was that "the lobsters have been making damn fools out of the scientists" (Stecklow 1991). They questioned the need for drastic changes in management, since they knew that catches had been very stable since 1947. (See Table 1.2) and even increasing. They did not believe that the brood stock had been damaged by overfishing since they saw large numbers of V-notched lobsters in their traps, and no small number of oversize lobsters [over 5 inches on the carapace]. Moreover, they were

committed to the idea that the goal of management should be to conserve the large reproductive-sized lobsters, and, for this reason, they believed that the V-notch and the oversize laws were the keystone of management. They believed that the oversize law created a sanctuary size for large lobsters [over five inches], and the V-notch law permitted large number of gravid females to reach that sanctuary. They also supported the oversize law as decreasing the temptation for offshore draggers to "drag for lobsters" since many lobsters caught in deep waters are over five inches on the carapace and cannot be landed in Maine. Some experienced lobster biologists agreed. Bayer, Daniel and Vaitones (1985) argue that the V-notch adds substantially to egg production, and Waddy and Aiken (1986) argue that the oversize law accomplishes the same thing. However, most dealers and offshore fishermen favored abolishing the oversize measure since they argued that these big lobsters were being caught anyway and landed in other states, and the Maine lobster industry might as well get its share of the business (Acheson 1988: 133-140).

Perhaps most important, the industry was opposed to raising the measure. In their view, this was unnecessary and would make it impossible to compete in markets for small and cheap lobsters, particularly when surrounding jurisdictions (especially Canada) have a lower minimum size. The industry also strongly suspected that raising the minimum size would result in a loss of income, their primary concern. A study done by the senior author showed that both catches and income would decline as the measure was increased incrementally over a period of years, and would only result in modest returns thereafter (Acheson and Reidman 1982: 10-11). Their concern about the move to a 3.5 inch minimum was heightened in the 1980's, a time when there were recent and rapid increases in imported lobster into the United States from Canada, lobsters

which could legally be brought into this country at a size less than Maine's legal minimum.

Within the industry, there was near unanimity on these issues. To be sure some industry members were in favor of abolishing the V-notch, but even so, a survey of MLA members revealed that "88% support retaining the 5 inch maximum size" (Jones 1985b).

Throughout the late 1970's and early 1980's the National Marine Fisheries Service and the New England Regional Council continued to lobby for the State-Federal lobster plan. The debate continue in the newspapers, legislature, and scientific white papers. The industry which had been largely apathetic about the prospects of Federal intervention in the late 1970's became increasingly concerned in the 1980's when it became apparent that the council's plan was being taken very seriously by the bureaucracies and legislators, and that this plan called for a raise in the legal minimum measure to 3.5 inches and the abolition of the V-notch.

In the 1985 session of the Maine Legislature, bills embodying various parts of the council plan had been introduced. The marine resources committee considered a bill to abolish the oversize law (five inch maximum), which had been introduced with support of many of the dealers. It also debated bills to impose large license fees and to impose a high tax on every trap fished. The leadership of the Maine Lobstermen's Association, and its President, Eddie Blackmore, became alarmed enough to take action. First, Blackmore began to lobby the Regional Council to include v-notch protection in the Federal lobster plan (Billings 1985b). Alan Guimond, the Chair of the Council was willing to do this although others on the council had serious reservations. More important, Blackmore and the MLA hired a professional lobbyist to counter these threats in the legislature (Jones 1985b). The MLA also put forth its own plan featuring a 600 trap limit and an apprenticeship program to slow entry into the industry (Billings

1985a). Other individuals and industry groups followed suit. All told, Maine's Lobster Advisory Council considered plans involving tag fees, higher license fees, closed seasons, and trap limits (Billings 1985a; Morrison 1985). Representative Scarpano introduced a single bill embodying all of these measures (Billings 1985b). All of these plans had one common element—they were designed to circumvent the State-Federal plan by conserving the lobster resource in ways that would avoid increasing the legal minimum size as well as maintaining the V-notch and oversize measure, which the industry considered essential.

The 1985 session of the Maine Legislature passed no lobster conservation legislation, primarily because, as Representative Scarpano said, no bill had overwhelming support in the industry (Morrison 1985). The legislature, overburdened with acrimonious debates, controversial proposals, and contradictory advice, voted to hire a consultant to study the lobster industry and make recommendations for future legislation. L. W. Botsford and Associates of Davis California was hired. The "Botsford Report," released in the spring of 1986, was diplomatically worded, to avoid exacerbating the bitterly contested debate. Botsford was clearly appalled at what he called the "adversarial struggle" surrounding the debate, and refused to side with one faction or another concluding that "no single option clearly emerges as the best policy." However, he found virtue in all of the proposals being advocated by all of the factions, including raising the minimum measure, the V-notch and the oversize law (Botsford, Wilen and Richardson 1986: 53-55).

This suggested an unusual solution to the leadership of the industry, namely embody into the lobster plan all of the key solutions suggested by all factions (Plante 1985: 13; Stevens 1986:12). Throughout 1986, Eddie Blackmore, MLA President, and Dick Allen of the Atlantic

Offshore Lobstermen's Association lobbied for a compromise plan in which the lobster industry would accept an increase in the minimum size from 3 3/16 inches to 3.5 inches if the Regional Council and the NMFS would agree to retain the V-notch and the oversize measure. Although Both sides had serious reservations about this plan. Federal administrators and scientists still though the v-notch and oversize laws were useless and fishermen from southern New England were also leery of these rules (Layton 1987). The Maine lobster industry was worried about he increase in the minimum gauge size. Eddie Blackmore said "We are going to recover from the wound of a small gauge increase, but we would be the long-time gainer if we do get v-notch protection for the whole range (of lobsters). I'm not in love with (increasing the gauge), but I can accept it to get the other" (Plante 1986). In spite of these reservations, the compromise plan had enough support to have been passed into law (Stevens 1987). The language of the bill called for the minimum size measure to be increased to 3.5 inches in four 1/32 inch increments, to take place in 1988, 1989, 1991, and 1992. The V-notch and oversize laws were to be retained in Maine (M.R.S.A *double s sign* 6431; Commercial Fisheries News 1987a). The same rules were incorporated into Amendment 2 of the Federal American Lobster Plan and passed by the New England Regional Council in 1987 (*Commercial Fisheries News* 1987b). It moved quite quickly the through the council process largely because of efforts of leaders of the Maine lobster industry. However, it is highly unlikely that this bill would have had enough support in the industry to have been passed into law were it not for a clear understanding that the NMFS and Regional Council would promulgate the V-notch and the oversize throughout the range of the lobster, and that the Canadians were going to raise their minimum gauge size so that the Maine lobster industry would no longer be disadvantaged in the large market for small lobsters. The Canadians

were to be prodded into action by the passage of regulations to ensure that undersize Canadian lobsters would not be imported into the United States. These two sets of factors resulted in support by the leaders of the Maine lobster industry, even though there was widespread concern among license-holders about the wisdom of the gauge increase.

In 1987, Amendment 2 of the New England Fishery Management Council's Lobster FMP was implemented, and the minimum size was increased from 3 1/16 to 3 3/32 inches in January of 1988. However, the increase in the measure was accompanied by a considerable amount of unhappiness, which quickly was transformed into an effort to stop the minimum gauge increase. According to Bill Brennan, who was the Commissioner of Marine Resources, there were several reasons that the industry wanted to stop the gauge increase. He said that during 1988, "the economy began to slide toward recession and the prospect of smaller catches due to a size increase became more threatening." At this same time, a study, done by Professor Robert Steneck [University of Maine] was released arguing that there were sufficient larvae in the water to maintain the stock, and questioning the need to increase the measure. The industry seized on this study as a further reason to delay the increase in the legal measure (Alden 1989a; *Commercial Fisheries News* 1989; Plante 1989a; Steneck 1989a). More important, the unwritten understanding which persuaded the leaders of the Maine lobster industry to support the increase in the minimum size did not result in the promised legislation. Efforts by the Canadian government to bring about an increase in the Canadian minimum measure ran into industry opposition and failed completely in June 1989 (Sonnenberg 1989c). Massachusetts and Rhode Island fishermen opposed implementing a V-notch measure and an oversize law.

Amidst a growing storm of protest, the gauge was increased again by 1/32 of an inch to 3

1/4 inches in 1989. At this point, the industry leadership united in a multi-state effort to stop the gauge increases. Because the economic impacts of the increased minimum size affected all sectors of the industry throughout the region, the prospects of further so-called "gauge increases" became an issue around which the region's industry rallied (Alden 1989b). In the summer of 1989, the leaders of the industry from the New England states called upon the Regional Council to delay the increase in the minimum gauge, and a formal motion to delay was offered at the August 1989 Council meeting. This motion was defeated by the Council which resulted in an angry response from the industry (Plante 1989b).

The industry was not expecting the Council to react in this way. After all, they had become very effective in influencing management decisions at the state level. This defeat drove home to the industry leadership that it would be far more difficult to effect change in the much more ponderous and complex institutional framework of the Federal government.

Even before the second gauge increase went into effect in 1989, the industry had begun a multi-pronged attack on the increase. Industry leaders lobbied their respective states for legislation to halt or delay the increases in the gauge. They also became actively involved in the Regional Council process by becoming members of the Council's newly created industry advisory committee, as participants at the Council's Lobster Committee meetings, and at meetings of the full Council. At the national level, industry leaders became very familiar visitors in the Washington offices of their regional Congressional delegations, focusing on the need for a law to prevent the importation of Canadian lobsters under the legal size. They also spent a considerable amount of time fostering relationships with government officials in leadership positions at the National Marine Fisheries Service and its parent agency, the National Oceanic and Atmospheric

Administration. Furthermore, industry leaders began to familiarize themselves with other fisheries management organizations, such as the Atlantic States Marine Fisheries Commission, and they developed relationships with various conservation organizations. Industry leaders also opened discussion with their Canadian counterparts in an effort to get an increase in the gauge in Canada (Sonnenberg 1989a).

These industry efforts two results. First, in 1989 both houses of the U.S. Congress passed the Mitchell Bill, spearheaded by Maine's Senator George Mitchell (the U.S. Senate Majority Leader), which prohibited importing and interstate commerce in lobsters smaller than the Maine legal minimum size (Sonnenberg 1989a; 1989b). The Canadian government argued that this bill was in violation of the U.S./Canadian free trade agreement, and petitioned for a dispute settlement panel (Sonnenberg 1989c). By June 1990, the arbitration panel had found in favor of the U.S. The industry quickly cast the gauge increase as a trade issue, and argued that this was another reason to halt the gauge increase. In August, at the urging of industry, a motion was introduced in the Regional Council to delay gauge increases due to the implication for "international trade and benefits derived through bettering of international cooperation" (NEFMC August 1990: 8). At one point, the Mitchell bill and the international trade in lobsters became a topic of discussion between President Bush and Canadian Prime Minister Mulroney.

Second, the raise in the minimum gauge was halted. By the end of 1990, sentiment in the Regional Council and the legislatures had swung against any more gauge increases. At the January 1990 meeting, the Regional Council voted to delay more gauge increases, and by summer 1991, Maine passed a law fixing the minimum size of lobster at 3 1/4 inches. Shortly thereafter, Massachusetts, Rhode Island, New Hampshire and New York did the same thing

(Plante 1991: 18a).

Eddie Blackmore, President of the Maine Lobstermen's Association, was instrumental in all of these activities, and proved to be a very effective spokesman for the Maine lobster industry. Getting the Regional Council to agree to protect V-notched and oversized lobsters, and halt the increase in the gauge was accomplished with great effort. When I congratulated him on these accomplishments in 1996, he said somewhat ruefully "It cost me five years of my life.

Certainly, the obdurate opposition of the industry played a primary role in stopping the gauge increase, but after 1990 some members of the Regional Council, despite their former support, had begun to suspect that raising the gauge was not the *sine qua non* of lobster management. They began to talk seriously about alternative ways of managing lobster without increasing the gauge.

The successful campaign to stop the increase in the minimum gauge resulted in a good deal of bitterness and cynicism on the part of some of the members of the Regional Council, officers of the National Marine Fisheries Service, and state fisheries agencies. They felt that the leaders of the industry had reneged on an agreement. Industry leaders point out that they had never thought that increasing the minimum gauge was a good idea, and went along with it only with a clear understanding that the Canadians would increase their minimum gauge. When the Canadians failed to increase their gauge, the leaders of the industry became convinced they had been gulled into making a bad bargain, one that severely disadvantaged their members. They had few compunctions about backing out of the deal under these conditions.

The acrimonious nature of the debate did little to facilitate future cooperation between the lobster industry and the Council and bureaucrats. Members of the Council and industry

described each other in far from complementary terms.

The successful move to nullify the gauge increase marked the beginning of a particularly nasty fight involving the industry, the Regional Council, the NMFS, and the ASMFC, which resulted in five long years of bickering and gridlock in which no lobster plan was accepted. Ultimately, this resulted in an end of Federal control and a return of lobster management to the states.

In 1991, the Council stopped the gauge increase temporarily with the passage of Amendment 3, an emergency measure. Shortly thereafter, the National Marine Fisheries Service promulgated the 602 Guidelines, which were duly published in the Federal Register. This guideline specified that all future fisheries management plans were to have a definition of overfishing. This was the genesis of the so called "10% rule," which has guided Federal efforts to manage lobster ever since. That is, lobster is considered "overfished" because egg production is under 10% of what it would be in a completely unfished fishery. [This will be discussed in detail in Chapter 7.]

In January 1992, Amendment 4 to the American Lobster Plan went into effect (Alden 1991). Amendment 4 specified that the increase in the minimum gauge would be halted for two years while an alternative plan to reduce fishing effort was developed (Sonnenberg 1992). If no acceptable plan was developed by January 1994, then the remaining two increases in the minimum size would occur automatically. It also specified that a preliminary definition of overfishing was to be developed, and that the escape vents in traps would be enlarged to 1 15/16 (Plante 1991). Amendment 4 also gave partial responsibility for developing the plan to the industry, a novel procedure which would mean bypassing the Council staff, which normally

developed fisheries management plans. (Stevens 1992; NEFMC October 1991: 10).

Amendments 3 and 4 were the result of the work of a coalition of industry leaders, officers of the NMFS, and some members of the Regional Council. They were motivated first and foremost by the knowledge that controlling effort by developing an alternative to increasing in the gauge was going to be very difficult. It was going to take real creativity and a different approach to accomplish this task. In addition, these people had all become interested in bottoms up approaches to management. The idea of co-management had been discussed at the Maine Fishermen's Forum and in industry circles for a number of years. Industry leaders had become convinced that a stewardship ethic would be promoted if the industry itself had responsibility for framing and implementing management decisions. They had also come to see that the lobster fishery was so varied that it could only be managed by dividing the lobster-producing areas into zones which had different rules. Members of the Regional Council were also in favor of stopping the gauge increase and developing an alternative method to controlling effort by giving industry more authority. Dick Roe, the Regional Director of the NMFS, was sympathetic, and in an uncharacteristic move for an NMFS officer, he voted for both amendments. Some of the state directors on the Regional Council also supported Amendments 3 and 4, including Bill Brennan, Maine's DMR Commissioner, and Phil Coates from Massachusetts. These bureaucrats had to contend not only with events in the Council but events outside as well. Dick Roe and NMFS Director, Bill Fox were under pressure from the Congressional delegation to stop the gauge increase. Commissioners Brennan and Coates had to contend with legislative pressure.

After Amendment 4 was passed by the Council, the Lobster Industry Working Group was formed to develop what would be Amendment 5. This group composed of the directors of the

various lobster industry groups (i.e., Pat White and Dave Cousins from the Maine Lobstermen's Association, Bill Adler from the Massachusetts Lobstermen's Association, and Dick Allen from the Offshore Lobstermen's Association, Maine). This group outlined the lobster management plan, and then went around the Regional Council to Bill Fox, the Director of the National Marine Fisheries Service, to get more action on the plan than they thought they would get from the Regional Council. Fox agreed to help develop the plan, and gave a grant to three consultants to accomplish this task (Plante 1993a). Nikki Bane, the NMFS's liaison to industry, explained "It's our responsibility to help develop this plan, . . . The council's against the wall. Their staff and funding are limited, and the council has so many other responsibilities"(Plante 1993a). Ominously, Douglas Marshall, Executive Director of the Regional Council, was very skeptical of this action and doubted that the consultants could put together a plan that would be passed by the council.

The grant money from the NMFS was used to hire three faculty from the University of Maine, including the author, who drafted what was to become Amendment 5 of the Federal Lobster Plan. They submitted their draft to the industry working group in the summer of 1992. The plan called for: (1) a two year moratorium on entry into the fishery, (2) development of a definition of overfishing, (3) a closed season on lobster fishing during the summer shedding season, (4) a prohibition on dragging for lobsters, and most importantly (5) dividing the fishery into zones and establishing effort management teams which would oversee a 20% reduction of effort in Maine and New Hampshire and a 50% reduction in effort in southern New England. This plan had to be submitted to the Regional Council for their approval.

The Regional Council received the report of the Industry Working Group in the fall of

1992 and spent the next several months negotiating various aspects of the plan. They abolished two aspects of the plan: the closed season for lobster fishing and the prohibition on dragging for lobster. The final plan submitted to the National Marine Fisheries Service in May, 1994 called for: (1) dividing the lobster fishery into zones and establishing Effort Management Teams (EMTs) to reduce effort. Each of these EMT's was composed of industry members appointed from each state, (2) a moratorium on entry into the fishery for 2 years, (3) mandatory log books, and (4) an apprenticeship program.

Amendment 5 never became law even though it had good support in the lobster industry itself. It fell victim to internal wrangling within the Council and competition between the Council and NMFS. The history of Amendment 5 from 1992 when planning for it started to 1996, when the NMFS withdrew the plan, is one of long negotiations, innumerable proposed changes, missed deadlines, and ultimately failure.

Deep divisions in the Council made it impossible to agree on the provisions of Amendment 5 and ways to implement it (Plante 1993b). Some members were still angry that the industry had reneged on the original agreement to increase the measure in return for support for the V-Notch and oversize laws. They were also disturbed that the final plan was going to be developed by the industry working group aided by hired consultants, known to be friendly to the industry, rather than the Council staff (Alden 1993). They were very reluctant to approve any plan that did not include an increase in the legal minimum size.,

Others on the Council had become convinced that they needed to explore ways to manage the fishery without raising the legal minimum size. They felt badly caught between the industry, which would go to any effort to ensure the minimum size was not raised, and the NMFS and its

allies on the Council who would accept no other alternative. They quietly supported some of the ideas of the consultants hired by the Fisheries Service to develop the plan.

Another source of contention between the lobster industry and the Regional Council was dragging for lobsters. Many in the lobster industry were increasingly committed to the idea of making it illegal to take large amounts of lobsters by draggers, which catch lobsters in nets designed to take fin fish. They argued that Maine had long outlawed taking lobsters by draggers, with good results. The Regional Council, which contained many representing the draggers, was opposed to stark reductions in the by-catch of lobsters for draggers.

Many officers of the NMFS felt that the goals of lobster management had been compromised. The lobster, in their view, was dangerously overfished. Biologists and administrators of this agency generally supported the 10% over-fishing definition, which in their view, could not be accomplished by any other means but raising the measure. When raising the legal minimum size was postponed by the Council by the passage of Amendments 3 and 4 in 1991, many officers of the NMFS were disappointed to say the least. Many were infuriated. They could not support Amendments 3 and 4, even though top officers of their agency were working to facilitate it. They were certain that this effort would fail, because they were certain that the industry could not come up with an acceptable plan.

Top officers of the NMFS supported the development of alternative plans that did not involve raising the minimum measure, but in retrospect, they worked in ways to make it almost impossible for such an alternative plan (i.e., Amendment 5) to succeed. To many observers, what they gave with one hand they took with another. The fact they hired consultants was regarded as an insult to the council and its staff. They strongly supported the overfishing

definition, but then supported the dragging interests on the Council who did not want to prohibit dragging for lobsters. Once the industry working group had produced a draft of Amendment 5, the NMFS strongly urged the Council to adopt it. But their primary tactic was to use threats of raising the legal measure and brinkmanship (Plante 1993b; 1993d; 1994b) in an attempt to force the Regional Council to agree on an acceptable implementation plan. This left many Council members seething.

Timing and deadlines became important issues. From the perspective of the NMFS, two years was an adequate amount of time in which to develop a plan and have it approved by the Regional Council. In January 1994, when the Council passed in a plan many considered inadequate, Dick Roe, the NMFS Regional Director said "the Council has known for two years that this was coming and now it's the eleventh hour." The Council most adamantly disagreed. From their perspective, the NMFS set such short deadlines that it was almost certain that the Council would fail to meet them. In the fall of 1992, the Council received the draft plan of the industry working group. At that time, Dave Borden, chair of the Council's lobster committee warned, "Even if you just take the industry plan and try to implement it, its unlikely that you'll meet those deadlines because of all the supporting documents that are necessary" (Plante 1992: 14a.). In the summer of 1993, when the Council was in danger of missing the December 31, 1993 deadline, several of the state directors including Bill Brennan of Maine and Phil Coates of Massachusetts, adamantly insisted that the NMFS find a way to extend the timetable (Plante 1993b). The NMFS refused, with the result that the Regional Council was rushing the clock all fall to make the December 1993 deadline (Plante 1993c; 1993d).

These kinds of problems resulted in months of negotiations in the Regional Council, in

which slow progress was made in putting Amendment 5 in final form and producing the supporting documents.

The Regional Council just barely met the December 31, 1993 deadline. They avoided the automatic increase in the legal measure by passing a plan which did not have all of the necessary documents, and which some Council members thought was incomplete (Plante 1994b). The NMFS approved only part of this plan, the requirement that the lobster-producing waters of the northeastern part of the U.S. be divided into zones and that EMTs (Effort Management Teams) be established to suggest ways of controlling fishing mortality in each zone. The Regional Council was given another six months to "develop a plan that would reduce fishing mortality"(Plante 1994c).

In May, the scheduled gauge increases were rescinded, and the rest of Amendment 5 was accepted on July 20, 1994 (Plante 1994c). However, Amendment 5 was accepted with the express understanding that the Effort Management Teams were to be formed and make recommendations on reducing effort in each of their zones by January 20, 1995 (Plante 1994c, 1994d). Four zones were created, each with its own EMT (Effort Management Team). Each of these zones selected different sets of effort management proposals. Each of the zones wanted to limit the number of traps a license holder could use, but they favored different trap numbers. The EMT from Zone 1 [Gulf of Maine-near shore] was persuaded by the Maine contingent to favor the V-notch and maximum size limits. Zone 3, in the offshore waters of the Federal Zone, proposed individual transferable quotas [ITQ's]. Zones 2 and 4 wanted other sets of rules (Plante 1995e). None of these rules were put into effect. That would have to await the coming of ASMFC management. But 1994 and early 1995 was a quiet period. The basic reason for this

unnatural silence was that all parties involved in lobster management were seriously considering moving responsibility for lobster management from the NMFS to the ASMFC.

In March 1995, the Amendment 5 struggle came alive again when the NMFS called for the development of a plan that took into account all of the recommendations of the EMT's to cut effort in the lobster fishery. This put an extra requirement on the Regional Council, which meant, in essence, that the Council plan had to incorporate five separate zone plans in Amendment 5 (Plante 1995a). This caused the council to delay action on the plan so they missed the June 20, 1995 deadline set by the NMFS for the council to pass a plan. The council said it needed more time to consider all five effort reduction plans put forth by the five EMT's. Moreover, the NMFS insisted that the states administer and enforce the plan, and the state directors were not sure they had the resources to accomplish these tasks (Plante 1995b). In response, the NMFS threatened to take lobster management out of the hands of the council by producing Amendment 6—a new plan—which they would write. They also repeated their threat to withdraw the entire lobster fishery management plan, which would nullify those parts of Amendment 5 that had been passed and approved (Plante 1995c, 1995d). However, Bill Brennan, DMR Commissioner and one of Maine's representatives to the Council, said that "by this time, it was too late. Lobster management had moved in other directions." In January 1996, the ASMFC took over control of lobster management after the NMFS had agreed to withdraw the Federal Lobster Management Plan.

Changing Horses in Mid-stream: The ASMFC Takes Over

By 1995, everyone concerned with the lobster industry had come to realize that management by the NMFS and Council was in grave difficulty, and there was general agreement

that responsibility for managing this fishery should be transferred to the ASMFC. Their reasons, however, differed considerably.

Assumption of power over the lobster management by the ASMFC came as no sudden thing. As early as 1991, a faction in the Regional Council, led by several state directors had begun to discuss the possibility of moving lobster management out from under Federal control. In the late 1980's and early 1990's many had been moved to anger by the heavy-handed approach of the Feds to force an increase in the minimum gauge, and their inflexible opposition to any other way of managing the fishery. During the long struggle over Amendment 5, the repeated threats of the Feds to increase the gauge if their deadlines were not met had many members of the Council bristling with anger, particularly since those deadlines were unrealistic to them. The state directors also had serious questions about the science involved in lobster management. The lobster stock assessment reports produced by Federal scientists indicated that the lobster resource was overexploited, and the NMFS was very rigid in insisting that the 10% overfishing definition be used as a benchmark for management. Some of the state directors were skeptical that the fishery was in a state of crisis, and they questioned the science behind the 10% overfishing definition. They were also increasingly concerned with the unwillingness of the Regional Council to do anything substantive about the issue of dragging lobsters.

Jurisdictional issues concerned the state directors as well. Increasingly they came to believe that the Feds had overstepped themselves where lobster management was concerned. After all, 80% of lobster are caught within three miles of shore. They became convinced that the states should take a primary role in managing the lobster fishery since it is carried out primarily in state waters.

For some of the state directors, the refusal of the National Marine Fisheries Service to accept Amendment 5 in December 1994 was the last straw. After that they saw no alternative to taking lobster management out of the hands of the Federal government.

In 1994, as the Council and NMFS came to loggerheads over Amendment 5, the ASMFC began to bring its own lobster plan up to date (Plante 1994a). In 1995, they began to develop a plan in coordination with the states that would impose one set of regulations in both state and Federal waters (Stevens 1995).

By 1995 when the efforts to implement Amendment 5 were in their final throes, the leadership of the Maine Lobstermen's Association became convinced that the ASMFC offered them a better forum than the Federal apparatus. After all, fisheries managed by the ASMFC were managed by the states. Each state had three members on the Commission. One is the head fishery administrator of the state, another is a public members appointed by the governor, who is usually from the fishery in question and the third is a legislator, who is usually too busy to show up at the innumerable meetings. In this arena, the lobster industry would have more regulatory power than they had in the Regional Council whose membership was heavily weighted toward the dragger industry. They saw that if they could get the governors of the New England states to appoint the right "public representatives" (i.e., industry people) and if they could get those people together they could carry great weight in lobster management. Thus, in the mid 1990's the leadership of the lobster industry began to lobby the Congress to manage the industry through the ASMFC, and end management by the apparatus set up by the FCMA (i.e., Regional Council and the NMFS).

The NMFS had also decided that it was in its best interest to give up lobster management.

The primary motivating force was the Clinton Administration's "initiative to reinvent government" which shrunk the size of the Federal government and resulted in across the board cuts in virtually every department. As a result, the National Marine Fisheries Service withdrew six fishery management plans, effectively handing over management of those species to the states (Plante 1996b). Lobster was an obvious choice for the Federal government to cease to manage since it is essentially an inshore fishery (Plante 1995f). At the time, people involved in lobster management speculated that another motive was involved as well. Officers of the National Marine Fisheries Service were very frustrated with the inability of the Council to produce a workable lobster management plan. After 20 years of impasse, one NMFS officer said that the fishery could only be managed if the NMFS preempted the control of the states within the three mile line, and bypassed the Council. Bill Brennan, Maine's Commissioner of Marine Resources speculated that preemption would almost certainly be opposed by the states in Federal court. In the absence of clear evidence of mismanagement, it was likely that the NMFS would lose such an attempt. Under these circumstances, officers of the NMFS thought it better to rid the agency of a troublesome fishery and transfer lobster management to the ASMFC.

In summary, the state directors, the industry, the Regional Council and the NMFS all agreed that authority for managing lobster should be transferred from the Federal system to the ASMFC. Their motives differed radically, however (Plante 1996a).

Management Under the ASMFC

The Atlantic States Marine Fisheries Commission is a compact of the states for managing Atlantic coastal fisheries that came into being in 1942. It was given a lot of additional authority by the passage of the Atlantic Coastal Fisheries Cooperative Management Act passed by the U.S.

Congress in 1993. This act committed the Federal government to support the efforts of the ASMFC by various kinds of partnerships and Federal funding. This act mandates that the Atlantic coastal states included in the compact implement and enforce the provisions of all fisheries management plans that are passed by the Commission. Failure to implement these provisions may result in the Secretary of Commerce placing a moratorium on the fishing for that species in that state's waters. In this sense, the act resulted in the 15 coastal states relinquishing a lot of power to the Federal government (Berger 1999).

On the other hand, the Atlantic Coastal Fisheries Cooperative Management Act increases the power of the Atlantic coastal states in that it allows them to enforce regulations beyond the three mile line in Federal waters, once a fishery management plan has been accepted.

In the ASMFC governance structure, each of the 15 Atlantic Coastal States has three commissioners, appointed by the governor of each state. There are also boards for each species, composed of industry representatives and others familiar with these fisheries. A fisheries management plan (FMP) is developed by the appropriate board; then it is passed by a vote of the ASMFC commissioners. Thus, the fisheries management plan for lobster is developed by the Lobster Management Board, and put into effect by a vote of the commissioners from all of the lobster producing states.

To transfer power for managing lobster from the Federal system to the ASMFC did not require any new legislation. The FCMA authorized the NMFS and Regional Councils to manage fisheries in Federal waters; the Atlantic Coastal Fisheries Cooperative Management Act authorized the ASMFC to manage some fisheries in both state and Federal waters. It is recognized that it is senseless to have one plan for state waters and another for the Federal zone.

This means that there is an agreement which governance structure will have primary authority for developing fisheries management plans for a species. Before 1995, the state and Federal governments agreed that authority to manage lobster would be given to the NMFS and the Regional Council. To transfer authority for lobster management to the ASMFC merely required that the NMFS "withdraw its lobster management plan," which occurred in February 1996 (Plante 1996a). After this the ASMFC took the lead in lobster management and proceeded to develop its own lobster plan. The NMFS was supposed to follow suit by developing comparable plans for the Federal Zone. As Bill Adler, president of the Massachusetts Lobstermen's Association explained the situation, "The ASMFC puts in regulations and then says to the feds "now you follow us in your waters." As we shall see, it wasn't quite that simple.

Development of Amendment 3 to the ASMFC Lobster Plan

The transfer of authority for lobster management to the ASMFC came about just before the U.S. Congress passed the Sustainable Fisheries Act in 1996. This law, which ungraded the ;Magnusen Fisheries Management and Conservation Act of 1976, made some important changes in the law. It called for managing fisheries for Maximum Sustainable yield, a concept that most people familiar with fisheries management thought was outmoded. More important, it said that if a fishery was deemed "overfished", the stock would have to be rebuilt within 10 years. It gave the National Marine Fisheries Service additional authority to accomplish this task. (PL 104-297: sec. 102 ,106 and 312.). The Sustainable Fisheries Act and transfer of authority for lobster management to the ASMFC radically changed the nature of lobster management.

Even before authority to manage lobster was passed to the ASMFC, the agency was hard at work revamping its own plan for the American lobster. The actions of the ASMFC were given

additional impetus by the Report of the 22nd Northeast Regional Stock Assessment Workshop, produced by scientists at the Northeast Fisheries Science Center, the NMFS Laboratory in Woods Hole, Massachusetts. This report concluded that the lobster was "overfished" in that egg production did not meet the 10% criteria. As a result, the ASMFC was bound by the Sustainable Fisheries Act to produce a plan to "rebuild" this stock in 10 years.

In the summer and fall of 1996, the lobster management board of the ASMFC began working on a management plan taking into account the goals spelled out by the Sustainable Fisheries act as well as the recommendations of the EMT's (Effort Management Teams). They drafted a set of options which might be incorporated into the final plan, and held hearings during November 1996 to get the reaction of lobster fishermen to them (Plante 1996c). George La Pointe of the ASMFC said they hoped to implement this plan "within 18 to 24 months", and no later than the end of 1997 (Plante 1996a).

By April 1997, the ASMFC plan, called Amendment 3, had taken shape; by December 1997, it was approved by the ASMFC commissioners (*Commercial Fisheries News* 1998a; Plante 1997b; 1998a). This was a very complicated plan. It established six different areas, each with its own lobster conservation management teams chosen from industry, which was charged with developing the conservation rules for that zone. Having specialized management areas and a mechanism that gave the industry a strong voice in management were very important to the leadership of the industry. It called for elimination of overfishing within eight years. Each area would also have different stock rebuilding targets based on the 10% overfishing definition (Plante 1998a).

In order to rebuild the stock within 10 years as required by the Sustainable Fisheries Act,

the ASMFC plan was to be implemented over the course of a number of years by imposing gradually stricter rules designed to achieve the 10% egg production goal by meeting a series of benchmarks. In the Gulf of Maine, for example, the schedule was to achieve 3.25% of the egg production of an unfished fishery in 1998 and 1999; 4.35% in 2000; 5.5% for 2001; 6.25% for 2002; 7.75% for 2003; 8.875 for 2004; and 10% for 2005 (Plante 1998a). The schedule would be met by adding addendums to Amendment 3 in each area in every year specifying the additional rules to be imposed.

Many of the rules proposed under the ASMFC's Amendment 3 plan incorporated a good many provisions that were already in effect under the lobster management plan approved under the Federal plan, including the prohibition on possessing lobster parts, the prohibition on taking berried females, the rules mandating the use of traps with biodegradable "ghost panels, the 3 1/4 inch minimum size, and the prohibition on spearing lobsters (Plante 1997a, 1998a). The 10% rule was maintained intact as a goal for lobster management. In addition, the idea of having lobster conservation management teams was inspired by the effort management teams, which had been a part of Amendment 5 of the Federal plan.

The ASMFC's Amendment 3 also contained other rules that had not been a part of the older Federal plan. Among these were protection of V-notched lobsters, a uniform vent size, and a maximum trap size. In this category was a limit on the number of lobsters that could be caught as a by-catch by draggers to 100 lobsters per day or 500 per fishing trip. (i.e., the so called 100/500 rule). It created a five inch rule for ASMFC Area 1 (i.e., inshore Maine, New Hampshire and Massachusetts down to Cape Cod) (Plante 1997a: Plante 1998a).

Further complicating Amendment 3 was the fact that its rules pertained to different

segments of the industry. Some rules would be universal, including the minimum 3 1/4 inch gauge, the 100/500 rule for dragger by catches, prohibition on spearing lobsters, the ghost panel requirement for traps, and prohibition of taking V-notched lobsters in the entire range of the species (*Commercial Fisheries News* 1998a). Other rules would apply coast-wide, but any state or zone could promulgate different measures "as long it can be shown to the ASMFC Lobster Board's satisfaction that alternative regulations provide for equivalent conservation of the lobster resource." Included in this category was licensing for different zones, escape vent, maximum trap size, and a maximum size limit. Last, each area would have separate trap limits.

(*Commercial Fisheries News* 1998a).

From the perspective of the Maine lobster industry, the total plan was not as important as the plan for Area 1, which included the waters of the inner Gulf of Maine adjacent to Maine, New Hampshire and Massachusetts to Cape Cod. When Amendment 3 was formally adopted in January 1998, the recommendations of the lobster conservation management team for Area 1 were accepted as well. Three features of Area 1's plan were of critical importance. The first was protection of oversize lobsters from the New Brunswick border to Cape Cod (Area 1). The second was protection of V-notched" lobsters throughout the range of the species. The V-notch and the oversize have long been key conservation rules in Maine where they are strongly supported. Representatives from Maine fought very hard to have these measures included in Amendment 3 since they did not want to see a plan passed that would make these rules illegal. David Cousins, President of the Maine Lobstermen's Association, said that "the most important "coup" was coast- wide protection of V-notched lobsters. This measure, in combination with the prohibition on taking oversize lobsters, ensured that the breeding stock preserved by the

efforts of the Maine lobster industry would not be taken by other fishermen. Third, the plan also gave Area 1 jurisdiction out to 40 miles (Plante 1998c).

Within the ASMFC, the politics of each of these measures was quite different. Pat White, one of Maine's three representatives to the ASMFC said, "We got the rule protecting the V-notch throughout the range of the species by arguing that it was a voluntary measure. No one had to V-notch anything if they didn't want to. [Of course protecting the V-notch lobsters meant that no one could take them if they had a notch in the side flipper, but somehow this was overlooked in the negotiations.] The five inch rule ran into a stone wall, and we only could persuade the New Hampshire and Massachusetts delegations to go along. We should have pressed it [with the representatives from southern New England and the Mid-Atlantic States.] After all, it only affects our area [There really are not five inch lobsters south of the Cape (Cape Cod)]." According to Pat White, the 40 mile zone limit for ASMFC Zone 1 came about as a result of a lucky break in the negotiations. He said, "Dick Allen [Rhode Island] proposed a line at 20 miles. Suddenly John Nelson, the New Hampshire Commissioner, proposed a 40 mile line. This was golden for Maine. I looked at Robin [Robin Alden the Commissioner and another Maine representative], and she looked back. We proposed to move on this amendment immediately. It passed." A forty mile line for ASMFC Area 1 was likely not in the interest of all New Hampshire lobster fishermen. Shaftmaster Corporation, based in New Hampshire, fishes in the outer Gulf and likely wanted a line closer to shore.

However, in order to get these positive measures included in the plan, the Maine delegation to the ASMFC had to include in Area 1's plan a provision to raise the escape vent from 1 7/8 inches to 1 15/16, and a provision to allow some dragging for lobsters. The so called

100/500 rule permitted draggers to take 100 lobsters per day or 500 per trip. Both these rules were unpopular in Maine. The increase in the escape vent, many felt, would allow a large number of legal-sized lobster to escape; and many lobster fishermen feel that a law similar to the Maine law prohibiting the dragging for lobsters should be passed for the entire industry. Area 1 's plan also included a graduated trap limit going from 1200 in 1998 to 1000 in 1999 to 800 in 2000.

In implementing Amendment 3 and the plan for Area 1 three problems were encountered. First, immediately after Amendment 3 was approved by the ASMFC in January 1998, the Outer Cape Lobstermen's Association (Cape Cod) sued the ASMFC, arguing that the plan "fails to address overfishing" (Plante 1998b). The real issue was that the plan prohibited taking V-notched lobsters. The lobster fishermen of the outer Cape had long taken large numbers of V-notched lobsters and wanted to continue (Plante 1998b).

Second, a group of Maine fishermen in the Boothbay area strongly disagreed with the provision of the Area 1 plan increasing the vent size from 1 7/8 to 1 15/16 inches, arguing that it would allow a large proportion of the legal lobsters caught to escape. Hearings were held on the issue, and in the spring of 1998 Sen Jill Goldthwaite, and Pat White of the Maine Lobstermen's Association, ASMFC Commissioners from Maine, strongly supported raising the gauge, arguing that Amendment 3 gave Maine what it wanted-namely protection of the V-notch and oversize lobsters. Failure to raise the escape vent to 1 15/16 inches would endanger all of Amendment 3, which would represent a great loss for the Maine lobster industry. In February 1998, the Maine Legislature approved the 1 15/16 inch trap vent size to keep Maine in compliance with Amendment 3 recommendations (Amory 1999a).

Last and most important, the NMFS attempted to impose its own version of trap limits on

the lobster industry in contradiction to the plan advocated by the ASMFC. To be sure, there was a clear understanding that the ASMFC would take the lead in developing a lobster plan and that the NMFS would withdraw its lobster management plan and implement measures similar to those of the ASMFC in the Federal zone. But passage of the Sustainable Fisheries Act in 1996 radically changed the situation, according to NMFS officials. The Sustainable Fisheries Act, which updates the FCMA of 1977, grants the Federal government a lot of power to manage fisheries which are deemed to be "overfished.." And since lobster was classified as "overfished," NMFS Director Andy Rosenberg refused to withdraw the Regional Council's lobster plan until the NMFS was convinced that it was replaced with a plan which would "address overfishing problem" (Plante 1997c). Harry Means (NMFS) said of the ASMFC plan, "There are no provisions in the plan that are meaningful. I'm not convinced this will freeze effort or achieve the objectives of the fishery management plan" (Plante 1997c). Empowered by the Sustainable Fisheries Act, the NMFS readied its own plan in 1997 and 1998, which was rumored to be far more stringent than the one passed by the ASMFC. Throughout late 1997 and 1998, there was constant discussion of this plan in industry and management circles. In 1998, the National Marine Fisheries Service reported that it was considering a trap limit in which fishermen would have to "build down" to 472 traps over the course of five years. Throughout New England, large numbers of fishermen were very upset by this news, fearing that such a low trap limit would make them into part-time fishermen or put them out of business altogether. On the whole, the Maine lobster industry was very much against the NMFS plan, and they came to favor the ASMFC plan. If the plan proposed by the ASMFC contained some provisions about which many were not enthusiastic (e.g., increasing the escape vent size) it was something they could live

with.

The NMFS held hearings on their plan in the spring of 1998. The Maine lobster industry and government leaders closed ranks to oppose the NMFS plan. The hearings saw a stream of industry leaders, officers of the DMR, and zone council members and chairs testify against the plan. Their comments were low key, to the point and, I thought, very persuasive. The ASMFC Commissioners also worked hard to have the ASMFC plan adopted. Nothing was done for months. Finally, the National Marine Fisheries Service released its final plan in December 1999. Essentially, it endorsed the ASMFC plan (Plante 2000). Only those privy to the inner workings of the National Marine Fisheries Service know for certain why the NMFS plan was withdrawn, but almost certainly massive political opposition played a role in that decision.

Differences in management philosophy, and tensions between the NMFS and ASMFC may well result in more trouble in the future. Senator Jill Goldthwaite, one of Maine's ASMFC Commissioners, said, "the NMFS is supposed to cooperate with us [the ASMFC]. But often times they just do what they want in the Federal zone." A basic difference is structural. The ASMFC is empowered by the Atlantic Coastal Act which is less strict in its requirements. The NMFS operates under the Fisheries Conservation and Management Act, and the recent update of that Act (i.e., the Sustainable Fisheries Act) which impose far stricter guidelines.

Despite these problems, implementation of Amendment 3 to the ASMFC Interstate Lobster Fishery Management Plan went forward rapidly. The plan was approved by the Commissioners on December 12, 1997, and in January 1998, the lobster conservation management teams began their work (Plante 1998a). By October 1998, the proposals made by the lobster conservation management teams of Areas 2, 3, 4, 5 and 6 had been approved by the

ASMFC Lobster Management Board. Area 1 did not have to do anything at this point, since Amendment 3 contained enough provisions to meet the management benchmark for Area 1 (i.e., V-notch, maximum size, trap limit, 1 15/16 escape vent.).

However, other benchmarks must be met every year if the management plan is to stay on schedule. One hurdle to the adoption of specific management proposals in Amendment 3 was posed by the lack of agreement by scientists on the lobster stock assessment. In April 1999, the ASMFC voted to split the implementation measures into two parts. They voted to hold off on implementing the egg-enhancing measures (i.e., increase in the measure in some zones, increase in the escape vent, etc.), called Addendum I, until a stock assessment had been completed, but to immediately implement all other measures which were contained in Addendum II. (Fishermen, especially those from Areas 3 and 4, argued vociferously at the delay, fearing that this would give the NMFS an excuse to implement its emergency default measures (Plante 1998b). Nevertheless, hearings on Addendum I were held in late spring of 1999 and approved in May. Action on Addendum II was postponed until 2000 when the stock assessment was finally done (Schick 1999). In the spring of 2001, work on Addenda 3 and 4 are under way to meet other benchmarks in the management plan.

In 2000 several problems dogged the ASMFC lobster management efforts. Some of these have the capacity to explode into serious issues that could take years to resolve. First and most important, the outer Cape Cod Lobstermen's Association is still spearheading the fight to be allowed to take V-notched lobsters and oversized lobsters in spite of the ASMFC Amendment 3 stating that V-notch lobsters would be protected throughout their range and that oversize lobsters would not be taken south to Cape Cod. The ASMFC may well allow fishermen

in ASMFC Area 2 (Cape Cod and Long Island Sound) to take v notch lobsters if they agree to a raise in the minimum measure to compensate. The Maine industry and the DMR are very much against this proposal, along with the Massachusetts Lobstermen's Association. Fishermen in Area 1 (Maine, New Hampshire and Massachusetts to Cape Cod) have been protecting oversize and V-notched lobsters. They vow that they will not sit idly by and allow the Outer Cape fishermen to take the lobsters they conserve who happen to wander South of the Cape. If the ASMFC allows the Area 2 fishermen to take V-notch and over size lobsters, Maine will almost certainly sue the ASMFC; and it is likely to be joined by the Maine Lobstermen's Association and the Massachusetts Lobstermen's Association. Karl Wilson, Maine's new head lobster biologist, points out that the case is complicated by the fact that how many v-notch the Outer Cape people take depends greatly on the definition of the V-notch employed. It is estimated that 30% of the catches of outer cape fishermen can be considered to be V-notched if a loose definition is used. However, if V-notched lobsters are defined as those which have at least a 1/4 inch deep notch right side flipper, then a much smaller percentage of lobsters can be considered as V-notched. A major fight is brewing over this issue. The Maine position is that it approved Amendment 3 with the clear understanding that V-notched lobsters would be protected in the entire range and that oversize lobsters would not be taken down to Cape Cod. Allowing the Cape Cod fishermen to take such lobsters would not only be poor conservation, but would be in violation of a signed agreement. The Outer Cape fishermen argue they are in a different administrative area and should have the right to set their own rules.

Another problem is being posed by New Hampshire, which is proposing that fishermen from their state fishing offshore should be allowed to use 2000 traps. This is being opposed by

Maine and Massachusetts, all of whose fishermen are limited to a maximum of 800 traps. Initial signs are that this problem may be solved without undue conflict.

Still another problem in 2000 occurred when Rhode Island voted to do away with the 100/500 by catch rule. They were voted "out of compliance" with ASMFC rules, which forced them to retain the 100/500 by catch standard.

The ASMFC is also having to deal with the fallout from the 2000 stock Assessment workshop which showed that the lobster brood stock was in reasonably good condition. Nevertheless, the ASMFC is insisting that the lobster fishery be managed with the 10% egg production goal and that the various ASMFC Lobster Conservation Management Teams meet the egg production benchmarks set in 1997 when Amendment 3 was accepted. In the spring of 2001, the LCMT's are raising serious questions about this policy. This will be discussed in greater detail in Chapter 8.

Last, another boundary problem is occurring in the Gulf of Maine . The Gulf of Maine, the most prolific lobster producing area, is divided into two parts: Area 1 whose waters are plied by thousands of small lobster boats whose owners have one management philosophy, and Area 3 , the outer Gulf of Maine, frequented by boats with another view of management. A basic difference is that most of the lobster boats in Area 3 are very large vessels owned by two large firms. The owners of those firms are advocating ITQ's, and have hired a full-time lobbyist to promote this type of management system (Spinazzola 1999). It is entirely possible that they will be able to influence the NMFS and the Congress to pass ITQ legislation for the offshore Area 3. Some of those involved in management feel that the efforts of these firms may undermine the ASMFC in ways that would affect the management systems of other zones. If this occurs, a

serious conflict will likely follow that may mark a new epoch in efforts to management the lobster.

In overview, it is ironic that the ASMFC is facing problems over boundaries that were put into effect at the insistence of the fishermen themselves.

Despite these problems, the ASMFC was far more effective in producing a workable management plan than the Federal governance structure. The ASMFC took 18 months from the beginning of plan development in the summer of 1996 to final approval in December 1997. The addenda to meet various management benchmarks are going forward. By way of contrast, the Federal governance system (i.e., the NMFS and the Regional Council) failed to produce a plan in 18 years.

Why was the ASMFC so much more efficient in developing a workable management plan? One reason, of course, is that the ASMFC's Amendment 3 incorporated many provisions that had been a part of the previous Federal plan (i.e., Amendment 5). But there are other reasons the ASMFC succeeded. Many of these were discussed in a hearing in Portland in the fall of 1999 organized by U.S. Senator Snowe of Maine, who is chair of the Senate Commerce Committee's sub-committee on Fisheries and Oceans. A number of people testified, who knew a great deal about the history of lobster management. They mentioned a number of factors that helped to promote the ASMFC planning process. It was pointed out that the ASMFC gets more timely scientific information. Spencer Appolonio, who had been Executive Director of the Regional Council in the 1970's, said that the ASMFC decisions are not "reviewed and second guessed" by another agency, referring to the fact that the NMFS reviews and approves (or disapproves) Council decisions. Pat White, President of the Maine Lobstermen's Association, said that the

Regional Council process is really "top down management," which does not involve those directly involved in the decisions (Stevens 1999). White's comment, I believe, really gets to the nub of the issue. The key to the success of the ASMFC's management approach is structural in large part. It permitted bottoms up management, and allowed for the development of rules matched to the needs of different areas. That is, the ASMFC divided the lobster producing area into areas, and allowed conservation management teams composed of industry representatives to develop regulations for each of them in line with local conditions and fishing practices. In generating Amendment 3, the ASMFC plan, the agency took into account advice from industry, and considered all kinds of options. This was unlike the NMFS and Regional Council management system which tried to generate rules for an entire region using a top down management approach. The effect of these two management structures can be seen in the way they have treated the minimum gauge issue. The Regional Council and the NMFS stubbornly spent 18 years trying to force the industry to accept a raise in the minimum size measure, a strategy that the Maine industry considered harmful and ineffective. It failed. The ASMFC lobster management effort is organized in a way that has allowed it to sidestep this issue. In Area 1 (Maine, New Hampshire and Northern Massachusetts), where an increase in the minimum measure is very unpopular, the goals of management have been met by using other means. In other ASMFC areas, where raising the minimum measure is more acceptable, it will be raised to meet various management goals

Another vary large difference is that the Regional Council has always been dominated by fishermen from the groundfish industry, who know relatively little about the lobster fishery and have a clear conflict of interest on some issues, such as the amount of lobster bycatch to be

permitted the dragger fleet. ASMFC decisions concerning the lobster fishery, by way of contrast, are made by the Lobster Advisory Board and the various lobster conservation management teams, which are composed of people who know the lobster fishery very well.

There are less tangible differences between the ASMFC and the Federal Management system as well. The deliberations of the Regional Council are highly politicized, and the atmosphere in the Council meetings are quite confrontational, with very forceful speeches and threats of retaliation. Pat White said that "a State Director going to a Regional Council meeting is a different person than when he attends an ASMFC meeting."

The Right Whale Controversy

After 1996, the lobster industry has had to contend with Federal regulations to preserve endangered species. In 1996, the state of Massachusetts was sued under the Marine Mammal Protection Act by Max Strahan, a private citizen seeking to invoke the act to prevent whales from being killed by becoming entangled in lobstering gear. In September 1996, a Federal judge ruled in favor of the plaintiffs and ordered Massachusetts to come up with a plan within 60 days to prevent lobster gear from harming endangered right whales (University of Maine 1996). Massachusetts complied by putting into effect a number of emergency regulations designed to protect the right whale in inshore waters where they were known to congregate. They banned the use of single lobster traps, sink gill nets, and polypropylene line; and required that all buoy lines attached to fixed gear have breakaway sections (Stevens 1997).

Lobster fishermen throughout the region were very concerned with the Massachusetts suit since it was recognized that other states could and would be sued under the Marine Mammal

Protection Act as well. It was recognized that something would have to be done in the industry as a whole. However, the fishing industry was feeling unfairly targeted. After all, most whale mortality is caused by collisions with vessels. In 1998, Terry Stockwell of the Maine DMR confirmed that in the past 25 years, ten right whales had died, eight from collisions with ships and only two from becoming entangled with fishing gear.

The National Marine Fisheries Service is charged under the Marine Mammal Protection Act with implementing rules to reduce mortality on all "strategic" stocks of marine mammals, which includes four species of whales in the Gulf of Maine. The right whale, which has a population of only 300, is listed as endangered, and is thus covered by the Endangered Species Act.

The National Marine Fisheries Service formed a "whale take reduction team" to draw up the plan. The NMFS put out its "Atlantic Large Whale Take Reduction Plan" in April 1997, designed to prevent death or injury to whales by fishing gear. In the weeks that followed, the Maine Lobstermen's Association, Downeast Lobstermen's Association, the DMR, and the newly formed lobster zone councils devoted considerable time to framing the state's response to the plan (*Commercial Fisheries News* 1997a). The NMFS held hearings in which the lobster fishing industry criticized many aspects of the plan. The proposed regulations concerning breakaway gear came under special attack by many fishermen, especially those from the eastern part of the Maine coast where very strong lines are needed to fish against fast-running tides (Jones 1997a).

The NMFS modified the plan with the comments of the fishing industry in mind. Essentially, the final plan, announced in July 1997, proposed modifying gear so that it would break away from entangled whales; and forming disentanglement teams to free whales that did

get tangled in fishing gear. The plan also restricted fishing in critical habitat areas, and extended the emergency regulations in these areas [i.e., Cape Cod Bay and the Great South Channel area east of Nantucket and Cape Cod] (Jones 1997a, 1997b; Plante 1997d).

The fishing industry and the DMR were generally pleased with the plan. Some of the environmental groups were not. When the NMFS announced the final whale plan, Robin Alden, the Maine DMR Commissioner, described the plan as "a great day for the state's more than 7000 fishermen and a great day for the 300 rights whales remaining in the endangered species population." (Jones 1997b). Some of the conservationists, however, accused the NMFS of caving in to industry pressure. Nina Young of the Center for Marine Conservation was quoted as saying "there is nothing new that prevents entanglement. It [the plan] represents retreat" (Jones 1997b).

During the next two years, the plan went into effect. Over 300 volunteer fishermen were trained to disentangle whales. Their training was coordinated by Glenn Salvador of the NMFS.

In the spring of 2000 the whale situation heated up again. A number of conservation groups had been carefully monitoring the right whale in the northwest Atlantic. In February 2000 a consortium of conservation groups readied a report documenting the number of whale entanglements in fishing gear. A total of 24 whales had become entangled, including six right whales. In 1999 alone, two endangered right whales died, one from being struck with a ship and a second, named "2030," from being entangled with fishing gear (Stevens 2000b). The report went on to say that current gear regulations would not prevent mortality and serious injury to the whales. They recommended the removal of "all vertical and floating lines that are capable of entangling right whales" (Stevens 2000a). Leroy Bridges, President of the Downeast

Lobstermen's Association, said that if such regulations were enacted, "it would finish us [the lobster industry]." (Stevens 2000a). It would certainly finish the lobster industry as we know it.

Worse was to come. In March 2000, the Conservation Law Foundation gave the NMFS 60 days notice of intent to sue under the Endangered Species Act. A spokesman for the CLF said that their fight was not with the fishermen, it was with the NMFS. (Stevens 2000c). They wanted the NMFS to spend the money allocated by Congress for gear research as intended. They also wanted gill netting closed when right whales were present in the "sliver" a small piece of water off the southeast Massachusetts coast. If this is all they want, there are less drastic means to achieve their ends than enjoining the Endangered Species Act. Using the ESA to achieve such ends is akin to solving the problem of a woodchuck in your garden by using an atom bomb. It will probably work, but the cost is excessive.

In May 2000, Max Strahan, who had previously sued Massachusetts, sued Maine under the Endangered Species Act (Stevens 2000d.) His demands were a bit more dramatic than those of the Conservation Law Foundation. Among other things, he is suing Governor King of Maine, DMR Commissioner George La Pointe, Penny Dalton, administrator of the National Marine Fisheries Service, and U.S. Secretary of Commerce William Daley holding them "personally liable for the environmental crimes that they have committed as employees of their respective government agencies. [The crime is allowing lobster fishing with traps which endangers whales]. The suit requests to have the court "hold [Maine Governor] King and other defendants in contempt and fine him and the other co-defendants \$100,000 per day until they prove to the court that they will no longer entangle whales and sea turtles in their fishing gear." He would require Daley and the NMFS to "grant Greenworld's [i.e., Max Strahan's group] petition for relief to

adopt an emergency regulation banning vertical buoy lines on lobster gear and gillnets" and order Governor King and the other defendants to "pay 10 million per year for 10 years to the plaintiffs so that they may implement a conservation program to increase the size of the populations of the endangered whales and sea turtles devastated by the commercial fishing activities of kind and the other defendants" (Stevens 2000d). All this sounds extreme and hysterical, but it is a serious threat. Max Strahan, it must be remembered, won the suit against Massachusetts by invoking the Endangered Species Act. The kinds of penalties he calls for are entirely possible under the ESA. The Endangered Species Act is written in extreme language. It makes it mandatory for Federal agencies to take all steps necessary to stop any activity that could possibly cause death or injury to one endangered animal. The costs and benefits of such actions do not need to be taken into account. If timber harvesting in the northwest can be curtailed to protect the spotted owl, who is to say that the lobster industry cannot be severely curtailed to protect the right whale?

In December 2000, the CLF suit and the Strahan suit had been postponed due to an error in the language used in the lawsuits. But we have not heard the end of this matter. 2001 may be the year when Maine learns that the lobster industry, that has done more than any other fishery to promote responsible conservation of a marine species, has fallen victim to a law designed to protect endangered species.

What is likely to happen if and when the whale suit goes against the lobster fishing industry which seems quite likely? If the lobster industry is forced to remove all vertical lines in the water, trap technology would be effectively outlawed. This would nullify the conservation program in effect in the industry, since the existing conservation laws are predicated on lobsters being caught in traps, a highly selective gear. That is, the V-notch program, minimum size,

maximum size, and prohibition against taking berried females only work because fishermen are able to select prohibited lobsters from traps and return them to the water unharmed. Of course, the escape vent allows sub-legal lobsters to escape from traps without being handled at all. Even worse, if traps are outlawed, the only way to take lobsters legally would be by dragging. Otter trawls are a notoriously unselective type of gear which take all categories of fish and lobsters. A sizeable proportion of the lobsters caught in such gear, including V-notched, egged lobsters, juveniles, and oversize lobsters would be killed or maimed in the process of being caught.

Even if the current lawsuit fails and trap technology survives, it is likely that rules will be put into effect to keep traps from being set in areas frequented by concentrations of whales. This could lead to closed areas, wide corridors running the length of the New England coast, closed to traps in the spring and fall when the whales are migrating. It is also possible that certain areas where whales are known to congregate, such as Cape Cod Bay and Jeffrey's Ledge will be closed to all fishing.

Started 1/27/01; Last worked on 2/25/01

Bibliography checked by Ann 2/26/01 and corrected 2/27/01. Bib corrected 4/24/01

Chapter 7

Science and Local Knowledge

In many fisheries, members of the industry and scientists working for management agencies are at odds. Each group tends to regard management options proposed by the other as ineffective, inefficient, counterproductive, and sometimes plain silly. Sometimes this results in regulations that one side or the other regards as undesirable. In other instances, it results in political stalemate, with no effective management program being passed.

Scientists and managers tend to view the cause of the problem in terms of the self-serving activities of members of the fishing industry, who, they feel cannot conserve the resources on which their livelihood depends. Fishermen, for their part, wonder about the quality of the science behind management proposals; for and are very suspicious of the motivations of scientists.

In the lobster fishery the same gulf exists between fishermen and scientists. They are very suspicious of each other (e.g., Stecklow 1991). Their assessment of the fishery is very different, and the prescriptions for management differ substantially. As a result, state and Federal scientists have found themselves on opposite sides of virtually every management issue in the past 40 years.

Recently a number of social scientists have pointed out that one of the factors driving a wedge between fishermen and scientists is that they have two different views of the oceans and

the way they work (Palsson 1994; Smith 1990). It is these differences of world view which underlie prescriptions for management.

While these authors have not fully explored these differences, our research indicates that competent biologists and experienced fishermen in Maine have constructed what amount to different realities of the fishery, which are at the root of many of the disagreements between them. In 1996, Robin Alden, who was then Maine's Commissioner of Marine Resources, nicely summarized the situation when she said: "fishermen and scientists are two groups of people with very high respect for their own knowledge and little understanding of what the other knows."

Both biologists and fishermen want to promote policies which have a favorable effect on stocks. The problem is that they have very different ideas about what influences stocks, and consequently very different prescriptions for managing the fishery. As we shall see, they each identify a number of factors that they are certain influence catches. Each of these suggests a strategy for managing the fishery. The politics of fisheries management largely revolves around fishermen lobbying to get one set of these strategies passed into law to positively affect lobster stocks, and the biologists lobbying for another set of strategies. However, it is important to note that not all of the variables identified as influencing catches become politicized. Some have been ignored, though others have become the basis for intense political confrontations regarding management.

Like all world views, the ideas of fishermen and biologists about what controls stock size are considered factual. They are not opinions, in the view of the respondents. It was relatively easy to find out what fishermen and biologists know influences catches and thus what they think should be done to improve the fishery. Getting at the underlying world view proved to

be much more difficult. The scientists were much more articulate about the reasons they promoted various kinds of policies and the science underlying their policy prescriptions. The fishermen were less so. Their view of the ocean emerged during the course of two studies which focused on a topic of great interest to them-namely what influenced catches.

Some of the explanations offered by fishermen and biologists are well buttressed by data. A surprising number are not. Separating fact from fancy proved to be a difficult, but very illuminating task.

This chapter addresses five questions: (1) What factors are identified by fishermen and biologists as influencing the behavior of lobsters, stock sizes and lobster catches? (2) To what extent are these explanations buttressed by data and thus objectively account for changes in stock sizes observed? (3) Which of these explanations about changes in stock sizes have been translated into strategies which fishermen and biologists push for in the political arena? (4) What is the source of the errors in the ideas about what controls stock sizes and thus management? (5) What are the implications for management?

Data Sources

Much of the information about the ideas of fishermen and biologists about factors influencing stock sizes was obtained during a study of the marked changes that have occurred in the lobster fishery in the last century, especially the "bust" of the 1920's and 1930's and the "boom" of the late 1980's and 1990's. Both the bust and the boom were well known to fishermen and biologists, and asking them to explain these phenomena proved to be a very useful tool in getting them to reveal ideas and beliefs about what controlled lobster catches, and what should be done to manage the fishery, interviews about the bust and the boom were very productive

because it appeared to be a safe topic. In these interviews people were not being asked about politics and management, topics which elicit emotional and guarded reactions.

Information on the opinions of fishermen about the bust and the boom were obtained in 1993 and 1994 from 60 lobster fishermen during the course of a study of attitudes towards management, and the social organization of the industry. I carried out all of the interviews, administering a questionnaire featuring both structured and open-ended questions. All 60 were full time, experienced fishermen in Knox, Lincoln and Sagadahoc Counties, and represented approximately 10% of the "full-time" fishermen in those counties. A large number of those interviewed were people who had been interviewed before; they were not selected by random sample. Nevertheless, we believe this questionnaire elicited information which accurately reflects the opinions of experienced, full-time fishermen in this part of the coast. The questions which elicited the most pertinent data were: "What caused the low lobster catches of the 1920's and 1930's?" "What caused the high catches of the 1990's?" Other useful questions were: "What needs to be done to ensure the future success of the lobster fishery?" "What laws, if any, have helped to increase lobster catches?" "Will lobster catches remain high in the future? Explain." Unfortunately, I did not ask any questions about dragging. Fishermen generally believe that dragging should be prohibited for lobsters since the heavy drags cause damage to the lobsters caught and to the habitat.

The views of biologists were obtained from a wider variety of sources. Many of the ideas of lobster biologists are contained in the literature which has been cited in this article; information on their views has also been obtained from private conversations and statements made in public and private meetings in the mid to late 1990's. Additional information on the

views of biologists about the bust and the boom were obtained on a ten day cruise in July 1996 on the research vessel "Sea Diver." The scientific crew on this cruise had all done extensive work on lobster and the lobster fishery, which turned the cruise into a floating lobster seminar. In short, the information on the views of lobster biologists was obtained through a variety of techniques: publications, public presentations, unstructured interviews, depth interviews, and participant observation in which emphasis is placed on asking general questions and not suggesting answers. No survey instrument was administered to the biologists. However, it is important to note that depth interviewing and participant observation produce data that is less neat, but far richer and more illuminating than data stemming from survey research. Survey research techniques, unstructured interviews and participant observation are all standard techniques in the social sciences. Anthropologists depend more on participant observation than any other technique (Bernard 1988).

Everyone familiar with the lobster industry knows that they are living in a period of unusually good catches. All of the fishermen and biologists have been able to observe the boom. Fishermen have a variety of explanations for their good fortune, which only partially coincide with the explanations offered by the biologists. Only the press is ignorant of the "boom." Throughout the 1980's and 1990's they continued to ply the public with a long series of stories about the "disaster" in the lobster fishery. This has been quite a successful campaign, and has resulted in the public believing that the lobster fishery is in a state of crisis. The reasons for this need will be explored in some detail in the next chapter.

Only two older fishermen interviewed had any direct experience with the bust, and they were boys when it occurred. This means that opinions about the bust were largely obtained from

information provided by others. However, every fisherman has heard of the bust and is aware of the disaster it brought people who lived through it. They would like to avoid another occurrence. The bust of the 1920's and 1930's is one of the few experiences that has been impressed in the memory of the lobster industry.

Data on catches, numbers of license holders, and number of traps, etc. were obtained from the official figures published by the Maine Department of Marine Resources (Maine Department of Marine Resources 1999). It is generally believed that the data from 1947 to the present are more accurate than earlier data. While it is impossible to estimate the precision of landings or trap estimates, it is important to note that our landings data mirror those of Canada, and that other scientists concur that the observed trends are credible.

The vast majority of fishermen interviewed in the 1990's had different explanations for the bust of the 1920's and 1930's and the boom of the 1990's. Any single individual interviewed might have offered one explanation or a combination of explanations for the bust, and mention another factor or set of factors to explain the boom. Their explanations differed substantially from the biologists interviewed. In some cases, a few fishermen and biologists agreed on the factors causing either the bust or the boom, but where fishermen and biologists identified the same variable, they usually gave them different emphases and had a different slant on their effect.

In the following section, the variables fishermen identified as causing the bust and the boom are identified, and the data supporting each is assessed. Then the same type of analysis is done concerning the explanations of biologists for the bust and the boom.

The Bust and Boom: Views of the Fishermen

The Bust

Table 7.1
Changes in Lobster Gauge Sizes in Maine^{at}

Year	TL (in)	CL: inches (mm)	
		Minimum	Maximum
1874	10.5 ^b	3.65 (92.7)	
1883	9 ^b	3.32 (84.3)	
1888	9 ^b	3.32 (84.3)	
1895	10.5	3.65 (92.7)	
1907		4.75 (92.7)	
1919		3.50(88.9)	
1933		3.06 (77.7)	4.75 (120.7)
1935		3.06 (77.7)	5.00 (177.0)
1942		3.13(79.4)	5.00 (177.0)
1958		3.19(81.0)	5.19(131.8)
1960		3.19(81.0)	5.00(177.0)
1988		3.22(81.8)	5.00 (177.0)
1989		3.25 (82.6)	5.00(177.0)

Conversions of total length (TL) to carapace length (CL) were based on data in Herrick (1911) and analyses of Jay Krouse, Maine Department of Marine Resources (personal communication). All carapace lengths are postorbital measures that do not include the rostrum, except for the legal English measure of 4.75in. for 1907-1918, which extended from the tip of the rostrum to the end of the body. Regulations were obtained from the *Laws of Maine* and summarized by Kelly (1990)

^bSeasonal

There are two problems with the poverty gauge hypothesis. First, fishermen assert that in the past, gauge sizes were very high, reaching a maximum of 4.75 inches. They are assuming

that the 4.75 inch measure was a carapace measurement. It was not. The 4.75 inch measure that was in force between 1907 and 1919 was a total body length measurement, which was equivalent to only 3.65 inches CL. In short, no 4.75 CL measure ever existed. If such a measure had been enforced it would have made illegal 98% of the lobsters caught today.

Second, if the poverty gauge hypothesis were correct, we would expect the largest minimum gauge size to have been in the 1920's and 1930's when catches were lowest, and for catches to be relatively high when the gauge was at its lowest level. This did not occur.

If a large minimum gauge were the cause of reduced catches, those smaller catches should have been experienced between 1895 and 1919—not in the 1920's and 1930's when the gauge was actually much smaller. Moreover, if the large gauge had been the source of the decline in catches, then one would expect that when the legal minimum size was reduced, catches should have increased. This did not happen either. In 1919, the legal minimum size was reduced another .15 inches CL, and instead of increasing, the total Maine catch fell to 5.8 million lbs. The legal minimum size was further reduced, another .44 in CL 1933, and that year saw still another reduction in total catch. From 1937 to the present, the gauge has increased incrementally. Rather than falling, lobster catches have increased, and that increase has been especially fast after 1988.

Second, is the *culturing hypothesis*, which asserts that lobsters get a large amount of their food from the bait placed in traps. In the 1920's and 1930's, the number of traps was small, decreasing the amount of food available for lobsters, which in turn, reduced the stock of lobsters. As the number of traps increased after World War II, the bait supply supported a larger population of lobsters. One fisherman in Boothbay Harbor said, "Every day, Boothbay fishermen

put thousands of pounds of bait in the water. That has become a large amount of their food supply. In the depression, the number of traps dropped off and they had nothing to eat."

Few data buttress the culturing hypothesis. It is based on the idea that the abundance of lobsters depends on the amount of food. Without food supplied by humans, lobster populations decline greatly. In fact lobsters can survive quite nicely even when there is little carrion on the bottom. They can filter plankton, and much of their food supply is marine worms. Moreover, even though the effect of the amount of bait on lobster populations has not been established, food supply is apt to affect growth rates and not abundance. Abundance is more a function of larval settlement and the percentage of larvae surviving after settlement (Wahle and Steneck 1991).

In addition, there is no close relationship between the decline in trap numbers and the decline in the lobster population. Before World War I, about 234,000 traps were fished in Maine waters; in the 1920s and 1930s, the number of traps averaged 198,000, or 15% fewer (Dow 1967). In this same period, catches went from an average of approximately 16 million pounds between 1906 and 1912 to 5.5 million pounds in 1924 (Table 1.2). If we are to take the culturing hypothesis seriously, we must argue that a 15% decline in the number of traps resulted in a 50% to 75% drop in catches. This is a difficult argument to make.

Third is the *illegal activity* hypothesis. Proponents of this idea assert that in the 1920's and 1930's the conservation laws were violated so massively that the lobster population was reduced.

This hypothesis likely has some substance to it, although solid data are lacking. There is good evidence that there was a massive trade in undersized lobsters before World War II (Judd 1988). Fishermen typically kept short lobsters to feed their families, and it was common for

people to smash up short lobsters caught in traps and use them as bait. Even worse, many fishermen "scrubbed" the eggs off the berried female lobsters they caught, using a stiff brush, and then sold them. The biologist Rathbun was horrified at the "wholesale slaughter of females with eggs, which has always been going on." Other biologists made similar comments (Cobb 1901: 124; Herrick 1911: 370).

Although it is impossible to estimate the losses due to illegal practices, there can be little doubt that the short lobster trade increased mortality on adolescent lobsters and that scrubbing and keeping berried lobsters reduced the breeding stock and the number of eggs in the water. The experienced biologists writing in the early decades of the century were convinced that such practices were causing a good deal of damage to the resource. They were probably correct.

A note of caution should be sounded. In the early years of the 20th century, boats were small, and the lobster fishery was confined to inshore waters. The deep water habitats where a sizeable percentage of the large reproductive-sized lobsters lived remained virtually unfished. Even if there was a large amount of illegal activity on inshore stocks, the amount of damage to the reproductive potential of the resource could have been minimal.

The Boom

The fishermen generally had four explanations for the boom of the 1990's.

The first is *decreased predation by groundfish*. According to this hypothesis, lobster stocks were at a high in the 1990's because groundfish which feed on them are at low levels. One fisherman said "big cod eat little lobsters, and there are very few cod in the Gulf of Maine at present."

The evidence for this hypothesis is mixed. In assessing it, two biological facts are

critical. Very large lobsters have no natural enemies, and are not eaten by any other species, even large cod or haddock. However, there is a good deal of evidence that big groundfish prey on small lobsters. In 1909, Dr. Francis Herrick, perhaps the most knowledgeable lobster scientist of the first half of the 20th century, wrote "Next to man with his traps, the codfish is probably the most destructive enemy of the lobster, for it not only takes in the soft and hardshell animals alike up to 8 inches or more length, but is very partial to the young from 2 to 4 inches long" (1909: 215).

Moreover, experimental work supports the idea groundfish, including sculpins (*Tautogolabrus adspersus*), eat small lobsters (i.e., those under 1 inch CL) (Barshaw and Lavalli 1988; Wahle and Steneck 1992). When small lobsters (1.57 - 3.54 in CL) were tethered inshore (anchored to the bottom so they could not hide or escape) where few large groundfish were found, very few were eaten. None were eaten which were over 2.326 in CL.(Steneck 1989b). However, 80% were eaten within 24 hours when they were tethered in offshore areas where large groundfish are more abundant.

Some historical data also buttress the predation hypothesis. There is a very strong possibility that groundfish predation contributed to the bust of the 1920's and 1930's. In the early decades of the 20th century, there were large populations of big cod and haddock throughout the Gulf of Maine, and groundfish catches remained high until the 1930's. At the same time, the average size of lobsters decreased markedly in the 1880's and 1890's and has remained relatively small ever since. This means that in the 1920's and 1930's (the bust), large stocks of big cod and haddock coexisted in the Gulf with lobsters of sizes they could easily eat. This may well have resulted in large losses to predation in those years.

Further supporting the predation hypothesis is the fact that lobster catches began to increase in the late 1930's and 1940s after ground fish catches had been low for several years (Table 1.2). In 1925 15 million pounds of haddock were caught and 22 million pounds of cod. In 1938, only 2.5 million pounds of haddock were caught ,and cod catches had declined to 6 million pounds(U.S. Bureau of Commercial Fisheries 1956). In 1949, it was reported that "groundfish stocks had been depleted." (Maine Commissioner of Sea and Shore Fisheries, Annual Report 1949). In 1937, catches of lobster began to rise and the increases in catches continued through the 1940's (Table 1.2). This inverse variation of lobster and groundfish catches does not prove that predation plays a important role in influencing the size of lobster stocks, but it is consistent with that hypothesis.

Some data do not support the predation hypothesis. Eighty percent of all lobsters landed are caught in inshore waters, and large numbers of big cod and haddock have not been seen within 20 miles of the Maine coast for decades. This strongly indicates that the increases in lobster landings since the late 1980's (the boom) cannot be due to the absence of groundfish.

Recent studies of show that lobsters are not found in the diets of groundfish. These data have been interpreted to show that cod do not eat lobsters (Bowman 1981; Pezzack 1992: 124). This may not be the correct interpretation. After all, most groundfish are now found in offshore areas where the average size of lobsters is so large that they cannot be eaten.

A second explanation for the boom is is the *conservation ethic hypothesis*, which holds that the boom is due, in great part, to increases in effective conservation legislation, which has been passed over the course of the past 70 years . In the view of fishermen making this argument, several laws have resulted in greater lobster populations. The most important of these is the V-

notch law and the oversize (five inch). These laws, it is asserted, have preserved more berried females and thus increased the number of eggs, and recruitment. [Recall: fishermen cannot take any egged females. They may voluntarily put a notch in the side flipper of a lobster with eggs. Such lobsters can never be taken. The five inch law protects all lobsters over five inches on the carapace. These laws are designed to protect proven breeding stock and large, reproductive-size lobsters.]

The minimum size law, the escape vent law, which protect the juveniles, as well as the ban on taking lobsters by dragger and scuba diving have also played a role in increasing the lobster population, but are less important. In addition, these fishermen argue, that there has been a huge decline in illegal activity and that these laws are now enforced, where they were widely disobeyed in the bust years.

According to these fishermen, the result of all of these laws and law enforcement is a huge brood stock, which under the right environmental conditions results in large recruitment into the fishery. One fisherman said, "The most important conservation law is the V-notch. Do away with that law and you do away with the industry." Another said "We have a lot of lobsters in the water due to the oversize and the V-notch." A very large percentage of the lobster fishermen would agree with these assessments.

There can be little doubt that support for conservation has grown over the past several decades, and that the massive violations of the law, which marked the earlier decades of the century, have ceased. Many observers of the industry, including Colonel Joe Fessenden, Chief Warden, Maine Department of Marine Resources (personal communication), have reported that lobster regulations are largely self-enforcing, meaning that fishermen themselves sanction people

violating the conservation laws. My own studies have also shown a growing awareness of a need for more effective conservation and support for conservation laws, particularly the V-notch and double gauge measure (Acheson 1975a: 661-666; 1989b: 212-213; 1993: 76-77).

Unfortunately, there is strong disagreement about the effectiveness of these regulations. The effect of the V-notch and oversize law are not known for certain, and no certain consensus has emerged among the biologists about their effectiveness.

State and Federal biologists have generally viewed these laws as ineffective. Thomas (1973a: 55) has gone on record as saying that the "maximum size regulation of 127-mm (five inches) carapace length is biologically unsound." Kevin Kelly, of the Maine DMR said in a meeting in December 1966 that "the V-notch is not based on science." Their reasoning is that mortality is so high that only a very small proportion of female lobsters survive to a size at which they can extrude eggs. Only 6% of all lobsters less than 3.54 inch CI or 90-mm are sexually mature (Krouse 1973). "Since over 90% of the landings come from lobsters within 10-11 mm CI of the minimum legal size" (Stock Assessment Review Committee 1996: 55), it follows that the vast majority of lobsters are caught just over the legal minimum size, when they are so small they have not had a chance to extrude eggs once. Thus, these biologists argue that there are virtually no lobsters that have survived to be 5 inches on the carapace. Since more than 90% of the lobsters are caught before they can extrude eggs, the percentage that could possibly be protected by the V-notch law is very small as well. They offer two additional indictments of the V-notch: (1) it is a voluntary program, and (2) it is a source of infection. These biologists buttress their findings with data from trawl surveys which turned up very few V-notch and oversize lobsters.

However, a number of scientists are not convinced by these arguments. Some university

and government biologists believe that the oversize law is effecting in protecting the resource. The number of eggs that lobsters carry, they point out, increases exponentially with size. (See Chapter 1). Moreover, large lobsters can extrude eggs twice on a single molt or copulation (Botsford, Wilen and Richardson 1986; Waddy and Aiken 1986). Dr. Robert Bayer's migration studies showed that large numbers of large lobsters migrated offshore. He argued that these offshore lobsters continued to produce a lot of eggs which replenished the stock inshore, and that migration, not overexploitation, likely accounted for the absence of these large lobsters in sea samples. These scientists believe protecting all lobsters over 5 inches CI does a great deal to protect the breeding stock and ensure egg production.

Bayer and his associates presented evidence that the V-notch is effective in protecting the breeding stock (Bayer, Daniel and Vaitones 1985; Daniel, Bayer and Waltz 1989). Data gathered by the Maine Lobstermen's Association showed that compliance with the V notch is very high among fishermen and that "over 60% of the egg-bearing females had a V-notch" (University of Maine Lobster Institute 1995). The idea that the V-notch is a source of infection was undermined by a study done by the Maine DMR biologists themselves, which concluded that the "chances of V-notched lobsters becoming infected by gaffkemia bacteria seem to be minimal" and that "V-notch wounds heal rapidly..." (Maine Department of Marine Resources 1987). Strong evidence supporting the effectiveness of the V-notch and oversize measures has been produced in the 1990's by modeling exercises. One study done by Wilson (1997) demonstrated that the V-notch in combination with the oversize measure increases the number of eggs in the water by 40%.

The idea that large, reproductive-size lobsters should be protected is scarcely new.

Biologists John Field and Francis Herrick advocated protecting large oversize lobsters in the beginning decades of the 20th century, arguing that these lobsters were especially prolific.

A third hypothesis that the boom is due to *increases in lobster habitat* brought about by the sea urchin industry. Kelp, it is argued, is ideal lobster habitat, and since sea urchins eat kelp, the amount of kelp covered ledge varies with the size of the sea urchin population. With the success of the urchin industry since the late 1980's, the number of sea urchins has fallen, causing a great increase in lobster habitat, and thus more lobsters.

One fisherman said, "The sea urchin industry has brought back the kelp beds. They have fished the urchins down so that the ledges are covered with kelp. This gives the lobsters a good place to hide. A few years ago, there were so many urchins that they had eaten the rocks bare."

Here again, the evidence is not clear cut. Some evidence suggests that the boom might be caused, in part, by an increase in habitat. Large areas off the Maine coast are covered with ledge, and the evidence supports the idea that these ledges are much better habitat for lobsters when they are covered with kelp than when they are bare. Harvesting sea urchins has resulted in more kelp covered areas (Elner and Vadas 1990). The work of Dr. Robert Steneck suggests that while enhancing habitat may not increase the number of lobsters, it could well change well their distribution. If cover inshore is good, inshore lobster populations might be augmented by large lobsters that would otherwise have migrated offshore, and by lobsters that would have been killed by predation in the first years of life (Bologna and Steneck 1993: 130-133; Steneck, McNaught and Zimsen 1995). Following this line of logic, the sea urchin industry could have helped to produce the boom by augmenting the numbers of lobsters in inshore areas where they are available to fishermen.

However, there again is negative evidence. The lobster boom, after all has occurred in all the coastal New England states as well as Atlantic Canada. Since the sea urchin industry occurs only in Maine, the favorable effects of harvesting urchins on lobster populations (if any) would only occur locally. The advent of the urchin industry cannot be used to explain the boom in Canada.

There are no reliable data on the interactions between the urchin and lobster populations and the amount of kelp during the early years of the 20th century. It is possible that there ere large populations of sea urchins during the 1920's and 1930's and that this may have helped to produce the bust. But there are no good data to support this contention.

The fourth explanation is what fishermen call "*the general cycles.* " This is based on the observation that lobster populations and the population of all marine species vary over the course of time, presumably due to changes in the ecology or other "natural" phenomena. These phenomena are very complicated, and affect lobster populations in ways which fishermen admit they do not completely understand. Fishermen may have very little effect on the whole process. Red Bickford of Pemaquid Harbor, who is now in his 80's, spoke for many in the industry when he said: "It's all a cycle. Sometimes it is up and sometimes it is down. You just have to be ready for what comes." For fishermen, there is wisdom in such statements. One cannot count on any stock of fish remaining the same. One has to be prepared to switch onto those species that are doing well, and be able to make that switch on short notice.

There is little doubt that lobsters are affected by a myriad of ecological factors. In 1978, we recorded very large catches and catches per unit of effort in Bremen, while town a few miles away had markedly lower catches. Jim Thomas, then Maine's lobster biologist, could offer no

credible explanation, but noted that he had seen such micro variation before (Acheson 1980).

For most biologists, statements about "cycles" are vague to the point of being meaningless. One said, "it's almost mystical." Another said, "saying it is a natural cycle is little better than saying that what goes up has to come down." They have no doubt that catches fluctuate, but the objective of science is to be able to explain and predict those fluctuations. Simply noting that fish stocks are not stable says very little in their point of view. Scientists, as we shall see, think they know a good deal, if not everything, about the factors influencing stock sizes. The natural cycle argument also in the view of scientists, is little more than a way of exonerating fishermen, who are seen as doing a lot of damage to the stocks.

We will return to the "natural cycles" argument since it goes to the very heart of the differences of the differences of viewpoint between fishermen and biologists.

The Bust and the Boom: Views of the Biologists

In studying the explanations offered by biologists, it is important to note that their information on the boom was much better than on the bust.

The lobster biologists interviewed in the 1990's were very concerned with the causes of the boom and had a good deal of data on factors influencing lobster landings in recent decades. However, they had come to no strong consensus about the causes of these high catches. Interestingly enough, the biologists interviewed in the 1990's knew about the bust and had some ideas about it, but really had not studied the causes of the disastrously low catches of the inter war years. The only biologist to make a thorough study of the bust of the 1920's and 1930's was Robert Dow of the Maine Department of Marine Resources, who published several articles pertaining to the bust in the 1960's and 1970's.

Like the fishermen, the biologists offered a number of reasons for the bust and the boom.

First, is the hypothesis that the bust can be attributed to *low prices*. Those advocating this point of view argue that during the late 1920's and the 1930's prices were so low that many fishermen went out of business, and the total number of traps in use was reduced, which, in turn reduced the catch. This hypothesis is the result of the work of this Robert Dow, who served as Commissioner of the Department of Marine Resources. He summarized the evidence for this hypothesis in the following words: "real landed value of Maine lobster averaged US \$0.023 to US\$0.101 per pound below the 1915 and 1916 levels throughout the 1920's and the 1930's, and probably accounts for the low fishing effort, which averaged only 203,000 traps per year for the period, well below the 234,000 trap minimum effort of pre-World War I years" (Dow 1967: 4).

An examination of the data give us strong reason to doubt that low prices were the primary cause of low landings observed in the 1920's and 1930's.

The data strongly support the idea that a large number of lobster fishermen went out of business during this time period, and that the number of traps in the water fell. Between 1928 and 1932, the number of fishermen in the industry declined greatly. While no official license numbers were recorded for many of these years (see Table 1.2), Commissioner Crie (Correspondence of the Commissioner 1933b) wrote that the number of licenses declined from 3807 in 1928 to 2587 in 1933, a 32% decline in four years. At the same time, the number of traps went from an estimated 211,000 in 1928 to 180,000 in 1933 (see Table 1.2.).

However, there is strong reason to believe that low prices alone were not the cause of the reduction in fishermen or the low catches.

First, the prices were not all that low if we correct for inflation. In 1933, the very depth

of the Depression, ex-vessel prices averaged about \$0.18 to \$0.19/lb and in 1935 it was \$0.23/lb. But \$0.19 in 1933 is equivalent to \$2.22 in 1994 dollars; \$0.23 in 1935 was worth \$2.26 in 1994. In 1989, the ex-vessel price for lobsters dropped to \$1.75/lb in late August and early September and they averaged \$2.56 for the year, not that much higher than the 1933 adjusted average ex-vessel price of \$2.22/lb. In 1993, ex-vessel prices went to \$1.75 (adjusted price) again for three weeks (Jones 1993). Prices were undoubtedly low, but equally low prices have been seen in the recent past when measured in terms of constant U.S. dollars.

Second, the data suggest that the root of the problem was low catches due to low stock sizes. Two of the best indicators of stock size are total catch and catch per unit of effort (Campbell and Duggan 1980; Fogarty 1988). During the 1920s and 1930s catch levels were the lowest in recorded history, averaging 5 to 7 million pounds (see Table 1.2). Moreover, catch per unit of effort (CPUE) not only was low, but fell during this time period. Between 1924 and 1934, the average trap produced 32 pounds of lobster per year; in 1932 the CPUE had fallen to an average of 29.1 lb/trap hauled. The fact that the CPUE was falling at a time when hundred of people were going out of business and the total number of traps in the water was decreasing is excellent evidence that the stocks were in poor condition.

Moreover, all of the historical data on this period indicate the catches were low as well (see Chapter 4). My interviews with older people all support the idea that catches were very low. Horatio Crie, who was State Commissioner of the Department of Sea and Shore Fisheries received numerous letters concerning low catches. Llewellyn Crowley (Correspondence of the Commissioner 1931b) wrote: "I have known the best of fishermen to go out here this winter and haul a hundred traps or more and get only nineteen to twenty pounds of lobsters and I for one

only get from six to —teen pounds [the first part of the word is obscured, "thirteen is likely]."

Another wrote, "Lobsters are very scarce and the price \$.25 per pound the fisherman hardly make enough to pay their expenses in catching them" (Correspondence of the Commissioner 1931f). If Crowley's figures are correct, fishermen were getting 1/5 of a pound for each trap hauled. Compare those catches with those received in the summers of 1999 and 2000, when even unskilled fishermen were getting over two pounds per trap hauled, and catches of four pounds per trap were observed.

The reason that fishermen left the lobster industry in the late 1920's and 1930's is undoubtedly due to low incomes received. Fishing income, of course, is determined by both size of catches and the prices received for them. Our data strongly suggest that the low incomes fishermen received were due more to low catches than to low prices. Even if prices were on the low side, fishermen could have maintained their income levels if catch levels were high enough to compensate. The disaster of the 1930's was rooted in weak prices, coupled with phenomenally low catches.

A second explanation by biologists for the bust and the boom is *water temperature*. Some of the most important biological processes of lobsters are controlled by water temperature, including, spawning, settling of larvae on the bottom, growth, activity levels, willingness to enter traps, and migration.

Biologists have investigated two hypotheses related to water temperature. First, if temperatures are high, activity levels increase, resulting in increased catches. Second, in years when water temperature is favorable, large numbers of lobster larvae land on the bottom in good condition; and if they happen to land on areas with good habitat, large numbers of them survive.

High catches are experienced seven years hence, when this year class reaches legal size.

The first hypothesis relating temperature to activity level and catches was explored by Dow (1969), who concluded that the bust was not related to temperature. "Some other factor than temperature had limited lobster landings during the period between wars" (Dow 1967: 4). Dow's conclusion stemmed from an analysis in which he attempted to link lobster landings with mean sea water temperature. His data showed that lobster landings were maximized when mean annual sea water temperature is between 9 and 11 degrees centigrade (Dow 1969: 61-63). Since lobster landings fell sharply after 1919, while the mean sea water temperature ranges before and after the war were the same, the low landings of the 1920's had to be related to something other than sea water temperature. At this time, Dow was correlating temperature with catch in the same year, which essentially was studying the effect of temperature on activity level and trapability. Thus, this study shows that temperature as it affects trapability has little or no effect on catches.

The second hypothesis linking lobster catches to larval settlement is supported by far more data. Since this hypothesis asserts that water temperature affects larval settlement, the effects of high water temperature would not be seen in landings until those lobsters reached legal size, about seven years later. Several scientists, including Dow, found significant co-variation between water temperature and data on landings 5 to 8 years later (Dow 1977; Flowers and Saila 1971; Harding, Drinkwater and Vass 1983). These studies support the idea that water temperature in the larval stage is important in determining future populations of lobsters.

More recent studies have confirmed that temperature controls the larval settlement (Boudreau, Simard and Bourget 1991), while others demonstrate that the number of larvae that

settle and survive strongly influences the abundance of adult lobsters (Campbell, Noakes and Elner 1991; Wahle and Steneck 1991, 1992). Understanding of the mechanisms involved have been augmented by studies showing that larval settling occurs during a 2-week period, usually during August in Maine, and that settlement is most successful at temperatures of 15 degrees centigrade and above. If water temperature is above 15 degrees centigrade, then large numbers of larvae settle to the bottom in good condition; if they land on cobble or other bottom which provides good cover, large numbers survive (Steneck 1989b). Thus, a year when August water temperatures are over 15 degrees centigrade should be followed seven years later by a large year class of lobsters molting into legal size. Lower than average landings should occur seven years after a year when August water temperature is under 15 degrees centigrade.

To what extent can the bust and the boom be explained in terms of water temperature? If this hypothesis is correct, the bust should have followed seven years on the heels of years when Maine August water temperatures were under 15 degrees centigrade; the boom should have been preceded by years when the August water temperature was over 15 degrees centigrade.

Dr. Robert Steneck and I attempted to test this hypothesis by using regression analysis to study the relationship between state-wide landings and waters temperatures, measured in Boothbay Harbor, seven years previously. The results were mixed. The regression analysis of landings between 1946 and 1986 on August temperatures with a seven year lag resulted in an R-square of .54, indicating that 54% of the total variance in landings could be explained in terms of August water temperatures (see Figure 7.1). These data give strong evidence that much of the variation in lobster catches in those years can be explained in terms of temperature.

However, the regression results of the boom years show no relationship of landings to

temperature since 1989. Moreover, water temperatures recorded seven years before the boom years are not higher than in many of the years from 1946 to 1989 or for those in the late bust, for that matter. Clearly something besides water temperature alone is behind the boom.

Figure 7.1 goes here (regression)

Our regression results of the bust are difficult to interpret. Regressing landings on temperature during these years (i.e., 1936 to 1945) gave an R-square of .57 indicating that 57% of the variance in landings could be explained by water temperature. Both the regression coefficient and the slope of the regression line was similar to that of the following 44 years. This suggests that temperature influenced settlement success in a consistent way. However, landings in these years was about 10 million pounds lower (indicated by the lower regression intercept). I suspect there is a historical reason for these low landings. During the height of the bust (1919 to 1937) both the total stock and the brood stock were very low. Even though water temperature was favorable to settlement success from 1936 to 1945, it is likely that were not large numbers of enough larvae due to the low population of reproductive-sized lobsters. It may have taken well over a decade before favorable water temperatures, settlement success, and increasing stock sizes resulted in an upward spiral of a magnitude that would result in the large catches observed after 1947.

Our analysis of the bust is made difficult by the fact that continuous August water temperature data is only available after 1929. Water temperature data from 1912 to 1928 is not available, which makes it impossible to say anything definitive about the effect of water temperature on landings from 1919 to 1935, the worst years of the bust. Bob Steneck and I have studied the bust in some depth (Acheson and Steneck 1997). We suspect that August water

temperatures were very low seven years preceding the worst years of the bust, but we will never know for sure unless additional data turn up.

In summary, our data show that lobster landings are strongly influenced by water temperature. However, temperature alone cannot account for either the bust or the boom.

The third explanation offered for the bust and boom is *fishing effort*. According to the biologists offering this explanation, fishing effort is excessive in both the bust and the boom years. In the bust, overfishing led to stock failure. That is, fishing pressure was so high that the breeding stock was destroyed, resulting in poor recruitment in subsequent years. As Anthony and Caddy stated: "Landings declines are often interpreted to be stock collapse due to over fishing" (1980: 355).

Fishing effort is also used to explain the boom. The larger catches are the result of more, and better traps being placed over wider areas. Dr. Michael Fogarty of the National Marine Fisheries Service points out that effort has increased in a number of ways. He said that "there has been a general increase in the number of traps [see Table 1.2]. Fishermen are expanding the area they fish. One fishermen is fishing basins that were never fished before. In addition, they are using 'wire gear,' which allows them to fish throughout the year and is also more efficient." However, in the view of these biologists, this increase in trap numbers is far from desirable. In their view, more traps can lead to increased catches in the short run, and overfishing and stock failure in the long run. The larger catches are analogous to eating the seed corn. These larger catches result from overexploitation of the stock, which is likely to seriously reduce the size of the broodstock to levels that cannot sustain the fishery. In short, these biologists are arguing that fishing effort is one of the primary factors controlling stock size.

As we shall see, these predictions stem from stock-recruitment models, which posit that the size of fish stocks is strongly affected by fishing pressure. If these models are correct, then low levels of fishing effort should result in healthy stock sizes. High levels of effort should result in stock failure and low catches.

The data from the Maine lobster fishery do not support these predictions. The bust of the 1920's and 1930's was not a period of high fishing effort; rather, fishing effort was very low. In 1931 (the middle of the bust) for example, there were only 2,800 fishermen who used 168,000 traps to produce 5.3 million pounds of lobster. The boom, by way of contrast, was a period in which fishing effort was very high, and had been steadily increasing for decades. In 1999, a record high catch of 52.6 million pounds was taken by fishermen using an estimated 3,043,000 traps, also a record high (Table 1.2). If they do nothing else, such findings show that we cannot explain lobster catches primarily in terms of fishing effort. Other factors are clearly involved. We will discuss the implications of these findings for the state of fisheries science.

Explanations of the Bust and the Boom: An Overview

Fishermen and biologists tend to explain the bust and the boom in terms of different variables. However, some explanations were far more popular than others, and there was some overlap in their explanations. Moreover, both fishermen and biologists tended to account for the bust and the boom in terms of combinations of variables. A better idea of their viewpoints is afforded by looking at the numbers of fishermen and biologists who gave various explanations for the bust and the boom.

Two of the most productive questions asked to fishermen on our survey were "What caused the low lobster catches of the 1920's and 1930's? What has caused the high catches of the

1990's?" (The same questions were asked the biologists in open ended interviews.) The results are summarized below.

Table 7.2

Summary of Fishermen's Explanations for the Bust and Boom Periods in Maine^a

Explanation	No. of Fishermen's Responses		No. of Biologists' Responses	
	Bust	Boom	Bust	Boom
poverty gauge	46	0	0	0
illegal activity	30	0	0	0
general cycles	16	22	0	0
culturing	18	13	1	1
low prices	6	0	3	0
water temperature	2	4	1	4
predation	0	52	1	2
V-notching,	0	32	0	3
venting				
conservation ethic	0	24	0	2
habitat	0	28	0	2
larval and juvenile	0	0	1	4
fishing effort	0	0	5	7

^aData are from 60 interviews with fishermen in central Maine in 1993 and 1994. Most mentioned several causes.

The favorite explanations of fishermen in the 1990's for the bust of the interwar years are the poverty gauge and illegal activity. (The poverty gauge was favored by 76% of the fishermen

interviewed.) The culturing hypothesis and "general cycles" were next most preferred explanations. Few mentioned low prices, although this was a popular explanation during the bust and in years immediately following. No fisherman ascribed the low catches in the bust to predation by groundfish or changes in the habitat, although these ideas played a prominent role in their explanations for the boom of the 1990's.

Eddie Drisko of New Harbor spoke for many experienced fishermen when he said, "What lobsters you caught, you couldn't keep because of the gauge. There weren't many lobsters out there. There was a lot of illegal activity at that time."

Biologists interviewed in the 1990's generally did not pretend to be expert on the disastrous 1920's and 1930's in the Maine lobster industry. Some would not hazard a guess about the cause of the bust, although it was clear they thought that excess effort likely played a role. Others had an interest in the subject, and their explanations involved effort in combination with temperature and prices. Dr. Michael Fogarty of the National Marine Fisheries Service cogently expressed this argument when he said: "the stocks were damaged [in many coastal areas in the years before World War I] by overfishing. The water temperatures in the late teens and 1920's were low, which prevented the population from rebounding as it might have under more ordinary conditions. In the Depression, the industry experienced marketing problems which drove large numbers of fishermen from the business."

Fishermen typically saw a number of variables as explaining the boom of the 1990's. The two most commonly mentioned were low amounts of groundfish predation (i.e., no cod and haddock) and the effects of the V-notch and oversize measures. But many mentioned the conservation ethic (closely connected to the V-notch) and "natural cycles," a vague concept

summarizing changes in the environment. Only four pointed to water temperature.

The boom is an enigma to the state and Federal biologists. Even the most experienced and thoughtful among them admitted they were puzzled. Given the high level of fishing effort, they believed a bust could likely have occurred. They were very concerned with the level of effort. Most kept reiterating that fishing effort was dangerously high, and could easily lead to a collapse of the fishery. In explaining the high catches, they offered a wide variety of explanations, but they had not come to any definite conclusions.

When asked about the boom of the 1990's Douglas Pezzack, Regional Lobster Assessment Coordinator for the Department of Fisheries and Oceans of Canada, said "I don't know. Probably a complicated set of factors is involved." An increase in catches occurred throughout the entire northwest Atlantic (from Newfoundland to southern New England). This argues that some widespread and general factors were involved (Pezzack 1992: 115). He suspects that water temperature is responsible. But he is careful to note that there is probably a "complicated set of factors influencing lobster populations. We probably do not know how they interact," he said. Another experienced Canadian lobster biologist said "something is happening in the juvenile stage. There are more juvenile lobsters surviving." He was not sanguine about the future of the fishery in spite of the high catches. He said that "conditions are probably ideal now. When those conditions change, the high number of traps could depress stock very quickly."

As might be expected, both fishermen and biologists discounted the explanations offered by the other group for the bust and the boom.

When questioned, no biologist thought the poverty gauge hypothesis or the culturing hypotheses had any virtue as explanations for the bust. No biologist interviewed in the 1990's was

aware of the full extent of the illegal activity that occurred in the past. It was not a factor they mentioned in the interviews until they were asked about it directly, and several said they doubted the effect of such activity on catches could be evaluated. Most important, they generally do not believe that the oversize law or the V-notch are very effective, and they certainly do not believe they are a primary cause of the boom, although when questioned directly a few said such laws might have increased catches somewhat.

The fishermen strongly disagreed with the biologists' ideas about the causes of the bust and boom. No older fishermen thought that fishing effort was a primary cause of the bust. The older fishermen interviewed said that there were few traps fished in the 1920's and 1930's and that the idea that the low catches were due to massive number of traps being fished was nonsense. To them, the idea that the boom was caused by a large number of traps was nothing short of ludicrous. "If a large number of traps causes overfishing, why do we have so many lobsters" one asked. In view of the fact that trap numbers are at record highs (see Table 1.2) it is difficult to argue with his logic.

Only a few fishermen had heard of the water temperature hypothesis. Some thought that this did underlie the bust and the boom, and many others thought it was entirely possible. Most had never heard of Dow's hypothesis that the bust was caused by low prices, and the vast majority did not believe this was true.

One reason for the differences in perception about the causes of changes in stock sizes is that fishermen and biologists draw their conclusions from observing different parts of the lobster life cycle. Fishermen's knowledge about the lobster and the state of the stock comes from observing the size of their catches and what comes out of their traps. Since only five to seven year

old juveniles and reproductive-size lobsters are retained in traps, fishermen only have a chance to learn about these stages. Their explanations about what controls stock sizes pertain to these lobsters. That is, the poverty gauge, illegal activity, culturing hypothesis, V-notch, oversize, and minimum size measures all affect lobsters 5 to 10 years old.

Scientists are far more interested in the early phases of the lobster life cycle. They believe that the size of the stock is controlled by events affecting lobsters in the first two years of life, when they are in the post larval and early benthic stages. This is reflected in the kinds of explanations that biologists tend to favor. Excess effort and water temperature affect numbers of lobsters in these early stages. Some of the misunderstandings between fishermen and scientists stem from the fact that fishermen have no information on processes on which the scientists focus.

What Did Cause the Bust and the Boom?

Assessing the Evidence

The objective evidence on all of the various explanations offered by the fishermen and biologists leaves us very uncertain about what really did cause the bust and the boom. The evidence contradicts the poverty gauge hypothesis and the culturing hypothesis, two of the most popular explanations offered by fishermen for the boom. There is also no evidence that the bust was caused by stock failure induced by massive overfishing or low prices, two explanations favored by biologists. Only the illegal activity hypothesis, advocated by some fishermen, seems plausible, and there is little objective evidence to support this one.

Explaining the boom poses other problems. There can be little doubt that large groundfish eat small lobsters, but the fishermen's idea that the boom was caused by decreased groundfish predation is likely not correct. It is more likely that groundfish predation contributed to the

bust-not the boom. Water temperature does appear to explain a good deal of the variance in catches between 1946 and 1988, but other factors were depressing catches in the bust years, and temperature appears to have no effect on the boom. Changes in habitat due to the sea urchin industry might augment the lobster stocks in Maine, but this cannot be an explanation for the boom as a whole since the sea urchin industry only exists in Maine. Perhaps, most important, the fact that the boom is occurring at a time when fishing effort is at an all time high is very strong evidence against stock-recruitment models, the most important explanatory device in the tool kit of the fisheries biologists.

In a recent article (Acheson and Steneck 1997) Dr. Robert Steneck and I hazarded a guess about the causes of the bust and the boom. In our view, in the past 120 years two factors have been of overriding importance in causing the changes in lobster catches: water temperature, and the growth of effective conservation legislation (Acheson and Steneck 1997).

Our statistical analysis suggests that recruitment is influenced by thermal controls on larval settlement. Moreover, the boom has occurred all over the northwest Atlantic, indicating that some very widespread phenomenon is working (Pezzack 1995). In our view, this strengthens the argument that temperature has been very influential in influencing stock sizes.

We are also convinced that changes in fishing practices have played an important role in producing the bust and the boom. Many knowledgeable observers of the industry in the late 19th and early 20th centuries, including biologists Herrick and Rathbun and Commissioner Crie, argued that stocks were damaged by illegal activity. More recently Canadian biologists have come to the same conclusion (Harding, Drinkwater and Vass 1983). Correspondingly, we believe that a decline in illegal activity in the past several decades has increased the size of the breeding stock

and recruitment. The scientific debate over the effect of the oversize measure and the V-notch law has convinced us that these measures have had a positive effect since 1950, particularly since they are virtually self-enforcing.

Furthermore, we believe the evidence supports the idea that predation by groundfish reduced lobster stocks during the bust and that increases in habitat due to the sea urchin industry may have increased lobster stocks and catches during the boom.

But these conclusions are not strongly buttressed by data and must remain tenuous. Our regression data do not support the idea that either the bust or the boom can be explained in terms of water temperature alone. The hypothesis that the bust was caused by illegal activity is not supported by statistical data. Although there is some evidence that the V-notch and oversize measure have helped to produce the boom, that evidence is not conclusive by any means (Bayer, Daniel and Vaitones 1989; Daniel, Bayer and Waltz 1989; Wilson 1997).

World View, the State of the Stocks and Politics

Our study of the view of the fishermen and biologists about the causes of the bust and the boom revealed some differences in intellectual commitments and an outline of the world view each has constructed about the ocean and the lobster. Their variant explanations reveal, as nothing else could, that both groups believe they know what has caused changes in lobster populations and, by implication, what should be done to conserve the lobster resource.

According to the fishermen, a variety of complex factors cause changes in lobster populations. These are not easily understood, and they are largely beyond the control of human beings. These interact in complicated ways which can cause rapid and unpredictable changes in stocks of fish. Many stocks of fish vary cyclically; none remains at the same level for long. As a

result, fishermen have to be prepared to change target species on short notice.

There is nothing that humans can do to ensure steady supplies of fish. All that can be done is to conserve fish stocks is to ensure that fish are protected at vulnerable parts of their life cycle. For this reason protecting breeding fish, breeding grounds, nursery grounds, and migration routes is especially important. This can be done by rules on "how" fishing is done. These are rules limiting where fishing can take place, when it can take place, and the technology to be used.

In the view of the fishermen, two kinds of variables have affected lobster stocks. Some of these are environmental variables such as water temperature, predation by other fish, and changes in habitat. Others are fishing practices that have affected lobsters at crucial parts of their life cycle. The most important of these are the laws protecting the brood stock (i.e., the ban on taking egged lobsters, the V-notch and the oversize law), and the rules protecting juveniles (the escape vent and the minimum size laws). Widespread violation of these laws in the early decades of the century made the stocks prone to crash, as occurred in the "bust." Lobster fishermen are also committed to the idea of maintaining the habitat by prohibiting dragging for lobsters.

Interviews with fishermen concerning the boom revealed that they thought that catches were very large because the stocks were in very good condition. Bert Witham said, "Fishing has been wonderful. There are a lot of lobsters out there." Rusty Court of Boothbay told me "Lobstering has been fantastic. You can catch lobsters anywhere and on any kind of bottom. Anyone could be a lobsterman last year. You didn't have to hit anything or any place in particular."

Fishermen were especially impressed with the size of the breeding stock. Time and again, discussion of the boom would lead to enthusiastic descriptions of the vast numbers of V-notch or

"seed lobsters" in coastal waters. Fisherman Brian McClain said every time he hauled his traps in the fall of 1996 he caught "at least 30 big, beautiful V-notched lobsters loaded with seed." David Cousins, President of the Maine Lobstermen's Association, said many fishermen believe the boom is due to a large and healthy breeding stock, and the health of this breeding stock is the result of the V-notch and oversize measure. He said "the members [of the MLA] can agree on keeping the brood stock."

But no fisherman expects this situation to be permanent. It's all a "cycle" after all. Simply maintaining a large broodstock which produce a large amount of eggs will not guarantee good fishing forever. In the words of one man, "there are hundreds of thousands of V-notched lobsters out there producing eggs. When conditions are right, those eggs hatch and produce scads of small lobsters. Right now we have a whole lot of small lobsters in the water." But he, and many other experienced fishermen, are fully aware that environmental conditions will not remain ideal permanently. Someday, something will change, and stocks will fall along with the catches and incomes of fishermen. This will be true regardless of the large broodstock. (None of this is to say that fishermen think we should do away with the V-notch or oversize law. The contrary is the case.)

While fishermen did not believe fishing effort was a primary factor in causing the boom, they were concerned about the large numbers of people and traps currently employed in the lobster fishery. Most were less concerned about danger to the stock than overcrowding and economic losses. In their view, large numbers of traps per se will not cause a disastrous decline as long as the broodstock and juveniles are protected. More damage will be done by fishing a small number of traps while disobeying the conservation laws, then by using a large number of traps

while protecting the broodstock and the juveniles.

The biologists have a different view of the ocean. It is one dominated by a commitment to stock-recruitment models, which are perhaps the most important intellectual tool employed by population dynamicists in the past 50 years. The central idea of such models is that the level of fishing effort influences the size of the spawning stock; the size of the spawning stock determines the number of eggs in the water, and ultimately recruitment into the fishery. The relationship between fishing effort, spawning stock biomass, and recruitment can be described mathematically. If a consistent amount of fishing effort is put on a fish stock, there will be a tendency towards a predictable-sized breeding stock, yield or recruitment. If fishing effort changes, a new equilibrium should be reached in time. A corollary is that the size of fish stocks is determined largely by the level of human predation, and that stock failure is caused by overexploitation. Environmental factors play no role in influencing stock sizes. A recent article in *Science* quotes one fisheries biologist as saying "Fish stocks collapse because of plain simple over fishing" (Barinaga 1995: 1043).

Exploitation is defined in terms of amount of fish taken. Life cycle is not taken into account. It doesn't make any difference whether these fish are adults, juveniles, or fish filled with eggs. A ton of fish is a ton of fish.

The biologists are very pessimistic about the future of the lobster fishery. They believe that effort on the lobster stock has long been too high, and that the lobster has been overfished. In their view, high levels of effort have driven the breeding stock to low levels. As a result, the fishery is in a precarious state and could collapse at any time. The high catches of the boom are scarcely a cause for celebration, since it is the result of dangerously high levels of effort which

cannot be maintained without leading to disaster (Anthony and Caddy 1980: 185). They can point to a number of text book cases in which high levels of fishing effort resulted in good catches for a while followed by a sudden stock crash. This conviction has found its way into a large number of papers on lobster management and official stock assessments going back over the past 30 years.

Conversations with fishermen and biologists had an enigmatic quality. The biologists are quite certain about the ability of humans to control the size of fish stocks. But they are relatively pessimistic about the future of the industry because of what they see as excessive effort pushing the stock to the limit. They would like to put in place far more stringent controls on effort before the inevitable stock crash. From their perspective, the problem is not the ability to control stocks, but political will.

The fishermen have far more doubts about the ability of humans to control oceans and the fish stocks in them. They are very suspicious of the scientists' claim that all will be well if we could only control fishing effort. In their view, environmental factors have important influences on stock sizes, which shows in their penchant for explaining changes in stock sizes in terms of predation by groundfish, water temperature, habitat, and especially "natural cycles." All humans can do is to help nature take its course by avoiding damaging fish in crucial parts of their life cycles. This shows in their commitment to the v-notch and the oversize laws, and their strong condemnation for dragging for lobsters.

Conclusions

There are three important conclusions to be drawn. First, fishermen believe that different factors control stock sizes than biologists. True to form, the fishermen tend to explain changes in stock sizes in terms of environmental (Habitat, predation, general cycles) and legal factors

(poverty gauge, illegal activity, V-notch, oversize measure, etc.). The biologist tended to explain the bust and the boom in terms of effort primarily.

Second, there is all too little objective evidence supporting the various arguments offered to explain the bust and the boom. The arguments concerning the causes of the bust are particularly weak; those offered for the boom have little evidence to support them. One has to conclude that many of the explanations of the fishermen are based in folklore; those offered by the biologists are not as scientific as they would like to think.

Third, the fact that we have such a tenuous hold on the factors that control catches means that we are formulating policies half blind. Some of the ideas driving management are simply wrong. We are working in an environment of great uncertainty.

Fourth, the fact that both fishermen and biologists believe they know the condition of the stocks and what causes changes in stocks underlies the long disputes about lobster management.

Fifth, the idea that fishermen and biologists need to agree on policy and science for co-management to work is clearly not correct. The data from the Maine lobster industry shows they can disagree about important issues and good policies can be put in place regardless.

Bibliography corrected by Ann 2/27/01; Note: Need bibliography on article page 3.

Chapter 8

The Politics of Science

In the past fifty years, lobster science has been highly politicized. At times, ideas of scientists have been judged in the cool, calm, objective atmosphere of laboratories where scientific facts alone decided the issue. Most of the time, scientific debates are linked with policy discussion which have been carried on in a far more public arena where various groups of scientists, administrators and industry members have debated. If the findings of scientists have influenced the discussion and the political agenda; and science has been influenced by politics. The agenda of scientists has been strongly influenced by the needs of administrators and the kinds of policies that were being debated at a particular time. Those engaged in policy discussions are fully aware that "scientific facts" are rarely completely neutral. They tend to favor some policy positions and detract from others. Success in this arena depends, in great measure, on the ability to influence what facts are presented and when, and even to influence what the "facts" are.

In discussing the politics of science, it is important to distinguish between the "facts" about what controls stock size, the policies suggested by these "facts," and the political acceptability of those policies. In many cases, scientists put forth what they considered the "facts." In some cases they were accepted as "true," and the policies they suggested were either accepted or rejected on the basis of the political support they could muster. But in all too many cases, what the scientists accepted as facts have been strongly contested. Ideas of industry

members always find their way into policy discussions; they also have influenced scientific agendas.

As was pointed out in Chapter 4, lobster conservation legislation was developed in three periods. First, in the 1880's and 1890's, the first conservation legislation was passed, involving size limits and a prohibition on taking egged lobsters. We know little about the politics of science at that time, beyond the fact that these conservation ideas originated in Europe, especially Norway. The second period was the early 1930's when the double gauge law was passed. We have covered the ideas and activities of biologists Field and Herrick during this period. The third is the period from the early 1970's to the present when the Federal government gained the right to regulate the fisheries with the passage of the FCMA in 1976. From that time to the present, one management effort has followed another at very close intervals. The accompanying scientific debate has been constant, increasingly complicated as simulation modeling gained ascendancy, and sometimes quite unfriendly.

In the past thirty years, the politics of science have involved two factions. One is the state and Federal biologists and their scientific allies. The second is the industry and their allies. The state and Federal biologists, who devote so much of their lives to lobster research and management, put out various studies and suggested policies. These have almost invariably been contested by members of the lobster fishing industry who have been informed by their own version of the biological facts. University biologists have periodically entered the fray, and on some occasions, have sided with the industry. More recently economists and other social scientists have influenced policies as well. Administrators and legislators have generally, but not always, formulated policies with the ideas of the Federal and state biologists in mind.

Science and the 3.5 inch measure, V-Notch and Oversize Laws

Since the early 1970's lobster management has revolved around a few issues. However, the assessment of those issues is changing due to changes in science; with these changes has come changes in policy prescriptions.

Over the course of the past 30 years, the state and Federal biologists have remained convinced that the lobster stocks are overfished and subject to sudden collapse. As early as 1973, Jim Thomas of the Maine Department of Marine Resources wrote that the lobster "population has been at a precarious limit to ensure an adequate parent-progeny relationship or derivatives thereof along the coast of Maine"(1973:8). In 1978, Vaughn Anthony, who was director of research for the DMR at the time told an audience at the Fisherman's Forum, "In the lobster fishery the effort is increasing, and it now seems probable that our inshore lobsters are from offshore parents; this loss of seed lobsters is alarming." Coupled with this, the water temperature is cooling so stocks are apt to drop through natural causes as well. As he viewed it, "we could be headed for a 'crisis'-and soon." (Maine Commercial Fisheries 1978a: 12). The same theme is found in more recent reports. The report of the 22nd Northeast Regional Stock Assessment Workshop (22nd SAW) concluded that "Fishing effort is intense throughout the range of the species and previous stock assessments have warned that the stock is overfished and vulnerable to collapse" (Stock Assessment Review Committee 1996: 47).

However, these biologists have never advocated solving the problem primarily by cutting fishing effort drastically through such measures as trap limits or limits on numbers of licenses. Rather, they have sought to increase the numbers of eggs produced by increasing the minimum size measure to 3.5 inches CL. If the 3.5 inch measure were adopted, there would be no need for

either the oversize law or the V-notch, in their view. Most of the early biological work supporting this point of view was done by Jim Thomas and Jay Krouse, biologists working for the Maine Department of Marine Resources. As we have seen, they argued that at least 90% of all lobsters are caught in the first year after they molt into legal sizes when they are between 81 mm and 92 mm [At that time the Maine legal minimum measure was 3 3/16 inches or 81mm.] Only 6% of the females are sexually mature at 81mm (3 3/16 inches), whereas nearly all females are sexually mature at 98mm, at least two years later. Thus, Thomas and Krouse concluded that 90% of female lobsters do not survive to extrude eggs even once. An increase in the legal measure to 88.9 mm/ would ensure that at least 60% of female lobsters would have an opportunity to extrude eggs. Thus, a small increase in the minimum size measure would greatly increase the number of eggs in the water and thus would have a profound effect on the future prospects for the industry. The oversize law, they argued, protected few lobsters since virtually all lobster were caught before they reached the sanctuary size of 5 inches on the carapace. Thomas concluded that if the minimum measure were raised to 3.5 inches, "the maximum size regulation of 127 mm [5 inches] carapace length is unnecessary" (1973a: 1). Furthermore, the V-notch, designed to identify egg-bearing females, was seen as a source of infection.

The Maine lobster industry was very committed to both the oversize law and the V-notch since these laws protect the most important lobsters-the breeding stock. The result was a series of horrific political battles intertwined with scientific debates that have not ceased to this day.

Over the course of 30 years the Federal and state biologists have continually advocated for increasing the minimum gauge. If they have not yet succeeded in having a 3.5 inch measure adopted yet, they have kept the issue on the table. In 1978, a recommendation to raise the

minimum measure to 3.5 inches (88.9-mm) was made a part of the Federal lobster management plan (Northeast Marine Fishery Board 1978). Throughout the early 1980's, the Regional Council and NMFS attempted to make a rise in the minimum measure to make the 3.5 inches the mainstay of their lobster management plan. They lobbied hard to get the Maine Legislature to increase the measure to 3.5 inches. An increase in the measure to 3.5 inches was a part of the Blackmore compromise of 1985, but this agreement broke down after the legal measure had only been increased to 3 1/4 inches, where it remains in 2001. During the Amendment 5 fight in the early 1990's, the Regional Council allowed the industry EMT's to develop plans which compensate for the loss of the 3.5 inch measure by imposing other rules to achieve their new 10% egg production goal, which would do the same thing as the 3.5 inch measure.

When primary authority for lobster management was transferred to the ASMFC in 1995, the fight for an increase in the minimum gauge continued since it was still advocated by the Federal biologists. As a result, a raise in the legal measure was made a part of the management plan put forth by the Lobster Conservation Management Teams [organized as a part of the ASMFC Amendment 3]. The single exception was Area 1 (inshore Maine, New Hampshire and Massachusetts to Cape Cod) where an increase in the measure is almost unthinkable due to the massive opposition in Maine (Plante 1999).

No biologist has argued that raising the minimum size measure to 3.5 inches would not raise the number of females able to extrude eggs. The only serious opposition to raising the legal measure on scientific grounds has been offered by University of Maine biologist Robert Steneck who argued in the late 1980's that a raise in the legal measure was not necessary since the breeding stock was large enough and the bottleneck in lobster production was adequate

habitat-not an inadequate sized brood stock (Plante 1989c).

Support for the V-notch and oversize laws have grown over the past three decades. In the 1970's and 1980's there was a strong push by NMFS to abolish these rules in the interests of regulatory uniformity, and because they were ineffective. These laws were only retained because of some masterful politicking by the leaders of the Lobstermen's Association, especially Eddie Blackmore and Dick Allen, who got support for retention of the V-notch and oversize laws at the cost of agreeing to an increase in the minimum gauge. Amendment 3 of the ASMFC, passed in 1997, ensures protection of oversize lobsters from the New Brunswick border to Cape Cod and protection of the V-notch throughout the range of the lobster in American waters.

It took a good deal of work by several scientists to counter the recommendation of the state and Federal biologists that the V-notch and oversize laws should be abolished. The work substantiated the fact, in one way or another, that the V-notch program and oversize laws were having a favorable effect (Botsford, Wilen and Richardson 1986; Bayer, Daniel and Vaitones 1985; Daniel, Bayer and Waltz; Waddy and Aiken 1986; Wilson 1997; Maine Department of Marine Resources 1987).

Biologists on the Lobster Technical and Scientific Committee, which advises the NMFS and ASMFC, are coming around to the idea that the V-notch and oversize measures are effective in conserving the lobster. The results of a modeling exercise were presented in 2000 showing how the goals of management (i.e., 10% egg production goal) could be achieved by combining changes in the minimum measure, the V-notch, the oversize measure, and the escape vent. The table showed that the 10% goal could be achieved by merely decreasing the oversize measure from 5 inches to 4.24 inches given the other rules in force at present. That is, if a 1 15/16 inch

vent size (present situation) were combined with a minimum gauge of 3 1/4 inch (present situation), with a 73% V-notching rate, and a 4.25 inch maximum (down .75 inches), then the egg production rate would be 10.4% of that of an unfished population (Lobster Technical Committee 2000: 4). This report was introduced with little fanfare, but it openly admits that the V-notch and oversize measures are effective management tools. When this table was shown to the Lobster Conservation Management Team of Area 1 at a meeting in Portland on January 8, 2001, a tentative vote was taken to meet the management goals by reducing the oversize measure to 4.5 inches. It is very likely that they will attempt to meet the 10% *egg* production goal by lowering the legal size.

This is a major change for the biologists. As late as 1996, some very competent biologists strongly believed that the V-notch and oversize laws were useless. I recall one conversation with Vaughn Anthony, who had just retired as head scientist at the National Marine fisheries Service Laboratory at Woods Hole where much of the stock assessment work on lobster is done. During this conversation, Vaughn said that the V-notch was ineffective, and that there were, he guessed, no more than 10,000 V-notched lobsters in the Gulf of Maine. When I told this to David Cousins, President of the Maine Lobstermen's Association, the result was incredulous (expletive deleted), he said, "I V-notch 4000 a year myself." If the Federal and state biologists have really had a change of heart and have changed their minds about the effectiveness of the V-notch, a major source of contention between the government scientists and the fishermen will be removed.

The last chapter in the 3.5 inch fight is being written in 2001. In 1998, when the ASMFC passed Amendment 3, the Outer Cape Lobstermen's Association sued, claiming that the plan did

not bring egg production to 10% of that of an unfished stock." (Plante 1998b). The fishermen of the outer Cape have always taken a lot of V-notched and oversized lobsters-most clearly from Maine.

The Politics of Modeling and the "Overfishing" Definition

Since the early 1990's the debate over the quality of science has taken a different direction. It has largely focused on the adequacy of the models being used by the Federal and state scientists. For more than a decade the predictions of the state and Federal lobster biologists about the state of the stocks have come from a very elaborate simulation model developed by Dr. Michael Sissenwine and Dr. Michael Fogarty of the Woods Hole Laboratory of the National Marine Fisheries Service. In recent years, Dr. Joseph Idoine has become the keeper the model, but has not made any drastic changes in it. In reality, three different models are used jointly. A "DeLury" model looks at size frequencies of lobsters to provide information on mortality and lobster abundance. The "length cohort" analysis examines changes in number of lobsters caught in different size ranges to estimate fishing mortality. Most important, is the "eggs per recruit" model, which, as the name suggests, estimates the number of eggs produced by legal-sized lobsters, and the yield of those eggs. It is this model that is used to determine whether the egg production goal of 10% of an unfished fishery has been achieved.

In recent years, three lobster stock assessments have been done, in 1992, 1996, and 2000. There are several major conclusions to be reached by studying them, their effects, and the politics that produced them.

The Stock Assessment Committees in 1996 and 2000 reached quite different conclusions. In 1996, the committee came to the conclusion that the lobster fishery was overfished according

to the 10% egg production criteria. Their report concluded that "Fishing effort is intense throughout the range of the species and previous stock assessments have warned that the stock is overfished and vulnerable to collapse" (Stock Assessment Review Committee 1996:47). The fact that these scientists considered the lobster "overfished" resulted in the stock rebuilding effort incorporated into the ASMFC plan (Amendment 3). (Stock Assessment Review Committee 1996: 47).

The 2000 stock assessment report is more tentative in its conclusions. There is no alarming prediction of impending disaster. The authors of the report conclude that in all areas the lobster stock is overfished according to the 10 % egg production criteria, more so in some areas than others. However, in all areas, they conclude that the stock is "growth overfished," but not "recruitment overfished." This means that mortality is high enough that lobsters are less than optimal weight (growth overfished), but the spawning stock is of adequate size and the lobster resource should be able to sustain itself (i.e., not "recruitment overfished") (American Lobster Stock Assessment Sub-committee 2000: i-iv). In short, this stock assessment report, unlike some of the earlier ones, is reporting an unhealthy situation, but not a terminal illness.

In 2001, the discrepancies in these two reports is causing political problems. After the 1996 report concluded that the lobster fishery was "overfished," the Sustainable Fisheries Act left the ASMFC no choice but to "rebuild the stock in 10 years." Accordingly, Amendment 3 of the ASMFC set up a series of "benchmarks" for each area and a timetable specifying the egg production goal each area was to reach in each year. After the 2000 report, the original egg production benchmarks were retained as the goals for management. The Lobster Conservation Management Teams began to ask if the lobster stock isn't "overfished," why are we being asked

to stick to the original schedule to rebuilt the fishery?

In the spring of 2001, George La Point, the Maine Commissioner of Marine Resources put before the lobster management board a proposal to extend the stock rebuilding program to 2008 rather than 2005. This gives the LCMT's an several extra three years to achieve the goals.

More important, there is serious talk in the ASMFC lobster board about supplanting the 10% egg production goal with other means of assessing the goals of management. In the spring of 2001, four optional "reference points" are under discussion. Using several different means to assess the state of the fishery will undoubtedly result in a good deal of lively discussion in the lobster technical and scientific committee and in the ASMFC itself.

Accuracy in the Models

For our purposes, modeling poses some deeper and more critical issues. People in the industry and some university and state scientists are very suspicious about the recommendations of the state and Federal scientists because they have deep misgivings about the models, the science on which they are based, and the political goals of those using them. In recent years, those reservations have been shared by legislators as well.

In the eyes of the detractors of Federal lobster science, there are two problems. Over the course of the past thirty years, it has become very apparent that state and Federal lobster scientists cannot predict changes in lobster stocks. Since the 1970's, state and Federal biologists have predicted disaster. Rather than falling, catches have risen dramatically in the boom years. Second, Federal and state scientists are accused of have consistently underestimated the size of the breeding stock. Fishermen say they have never seen so many V-notched lobsters and egged lobsters. Both of these criticisms have a good deal of substance. Nevertheless, in the past 30

years, lobster scientists have had a strong influence on the lobster management agenda. That influence has increased in recent years with the passage of the Sustainable Fisheries Act.

Fishermen find that maddening.

However, the state and Federal biologists do not think their models are seriously flawed. The fact that they have repeatedly predicted disaster only to see catches rise does not seem to have caused them to question their ability to predict stock changes or the adequacy of their methods. They believe it is their duty to sound a warning about the state of the lobster stocks. After all, population dynamicists have noted many cases where increases in effort have preceded stock crashes. There is no denying that fishing effort in the Maine lobster industry has increased greatly in the past few decades (see Table 1.2). Fishery scientists look at the figures on the increase in the number of traps and shake their heads in puzzlement that lobster stocks could continue to do well under such an onslaught. Dr. Colin Bannister, chairman of the advisory panel American Lobster Management Board expressed this view well when addressing the record high catches after the 1996 Report of the Stock Assessment Workshop was released. He was quoted as saying "The responsibility to constrain effort is still there," he said. "What happens if the recruitment mechanism reverses? The more effort, the bigger the crash when it happens. We don't know how far down the stock can go before affecting the survival of the population." He emphasized the need for a "precautionary approach" (Plante 1996d: 10A).

First and most important, the biologists are fully aware that their modeling work has not resulted in accurate predictions. They know that predicting a bust only to see the boom occur has hurt their credibility with the industry and others. They have responded to the anomaly of the boom by attempting to explain it in terms of factors that are resulting in large catches and thus

allowing the industry to get away with huge amounts of effort, if only temporarily. The authors of the Report of the 22nd Northeast Regional Stock Assessment Workshop expressed the problem in the following terms. "The daunting question, 'Why are there so many lobsters landed?'" Explaining increases in recruitment and catch after years of extremely intense fishing mortality is difficult. However, recruitment increased in the late 1980's throughout the range of the lobster, and catch is now decreasing many areas. Some reasons offered were environmental factors, an ever-expanding fishery (e.g., longer fishing seasons, increased effort, expanding fishing areas), and decreased predation. (Stock Assessment Review Committee 1996). Jay Krouse of the Maine Department of Marine Resource explains the increased catches in terms of increased recruitment, which is due to "elevated water temperatures," "lower predation [by ground fish]" and "greater larval production and yield in weight per recruit resulting from the 1988-1989 increases in the minimum legal size" (Krouse 1995:3).

Dr. Michael Fogarty told me in 1996 that a very large number of factors accounted for the increases in catches seen in the 1990's. He explained the causes of the current boom by stressing the "increases in effort due to more traps, better technology and more area being fished." He also said that "recruitment is up, there has been a changes in predator populations, the habitat has been enhanced, and water temperature has increased." He also said that "changes in the law (escape vents, increases in the minimum measure, and the V-notch program) were having a favorable effect on egg production. He finished by saying "all of this is a way of saying 'I don't know.'"

What is most notable is the fact that in explaining the boom, the Federal and state biologists are falling back on explanations offered by fishermen. They are saying that the lobster

stock is overfished, and maybe will crash, but that factors like water temperature, predation by groundfish, habitat, the V-notch program, etc. have been able to compensate for the high amount of effort, resulting in high stock levels and high catches (American Lobster Stock Assessment Sub-committee 2000: 140-183).

Strangely enough, none of these issues, debates and anomalies has resulted in any serious rethinking of the model. Meetings of the Technical and Scientific Committee for Lobster are exercises in fine tuning the model. There can be little doubt that there have been some improvements, such as including the V-notch and oversize measures. However, there have been no attempts to make radical changes in the model or replace it with a better one. In fact, most Federal and state biologists are apologists for the Federal lobster model. At least in public, they admit to little skepticism. No knowledgeable biologist has proposed discarding the model and starting over, or using some completely different means for assessing the state of the fisheries.

There are several reasons why the Federal and state biologists are reluctant to discard their model. For population dynamicists, stock-recruitment models are state of the art science. They are what are being taught in the best graduate programs in fisheries science as the best way to understand stock changes. They appear to have worked well in other fisheries. The boom presents anomalies, but they think they can explain this phenomena. Still, explaining the boom presents these biologists a serious problem. Even the dullest lobsterman can see the discrepancy between the bust which fisheries scientists have predicted for the past 30 years and the record high catches realized in the boom.

Why isn't the model used by Federal and state scientists to assess lobster populations predictive? There are undoubtedly several factors.

First, the data going into the model come from several sources, some of dubious quality. Much of the data on the state of the stocks is derived from trawl surveys done offshore by National Marine Fisheries Service personnel. These surveys gather data on all species by towing a large net along the bottom for a prescribed time in each location to be sampled, and then studying the catches of all species. The locations to be sampled are selected by random sampling techniques from the area between Cape Race Newfoundland and North Carolina. However, very few of these sites are in the Gulf of Maine, and none are within 20 miles of shore. Fishermen have complained that the NMFS was under-reporting the number of reproductive-sized lobsters because they were not dragging in the right places. There is some reason to believe they are correct.

Studies done near shore have their problems as well. There is a good deal of evidence that large lobsters migrate to offshore areas (Skud and Perkins 1969; Campbell and Stasko 1985; Campbell and Pezzack 1986). This factor might well account for the low estimates of the size of the brood stock (Anthony and Caddy 1980). The information that is obtained on offshore lobsters is likely to be skewed as well.

Second, Federal and state biologists do not have actual figures substantiated by research on several parameters used in the model. The model may be very sensitive to them. For example, biologists usually assume that natural mortality is 10%, but there is little evidence to support this figure (Conser and Idoine 1992). Real mortality might be much higher or lower, and may vary considerably from one time and place to another. If the 10% figure is inaccurate, this factor alone could result in mis-estimates of actual populations, since the models are particularly sensitive to changes in mortality figures (Acheson and Reidman 1982).

Third, the model assumes that a constant number of lobsters enter the fishery at 3.25 inches. The model does not take into account the larval stage or juvenile stages or what is happening to those lobsters during those phases. The effects in water temperature and predation on small lobsters, which may cause substantial changes in lobster populations, are not taken into account.

Fourth, and most important, stock-recruitment models are based on the assumption that recruitment is a function of broodstock size. Dr. Douglas Pezzack (1992) has shown that "no clear stock-recruitment relationship has been found in lobsters." In this regard, scientists in the U.S. have concluded that the recruitment curve is "quite flat," implying that recruitment remains constant over a wide range of stock sizes (Stock Assessment Review Committee 1996: 69). This suggests that large amounts of lobsters can be produced by relatively small brood stocks, and that large broodstocks can result in small amounts of recruitment if conditions are poor. It also suggests that other factors are more important in influencing recruitment than size of the breeding stock. These maybe environmental factors. This is, of course, exactly what fishermen have suggested.

If this is true, then the utility of stock-recruitment models has to be questioned. If the basic assumption on which such models is based does not hold true, how useful are they? This will be discussed further in Chapter 8.

Laura Taylor of the Maine Department of Marine Resources summarized the problem by saying, "They haven't got the models to work right. Even if they fix the model, they haven't got the right data to put into it."

Two different kinds of efforts are underway at present which may help to make the

models more accurate and predictive. First, studies are underway in Maine to gather better data on lobster abundance and the state of the breeding stock. The Department of Marine Resources is sponsoring one trawl survey which is being done state-wide, supervised by John Sowles. The other is a survey of the lobster populations of Penobscot Bay being done by Dr. Robert Steneck of the University of Maine, whose work is funded by the DMR and the Island Institute.

Preliminary data coming from the DMR trawl survey strongly suggest that the National Marine Fisheries Service has severely underestimated the size of the reproductive stock due to the sampling locations selected and the technology used. In February 2001, Carl Wilson, DMR's chief lobster biologist, reported that the trawl survey done in one location in eastern Maine turned up only 20 egged lobsters out of a total of 700 landed, a very low number. However, he said that he was on a boat fishing nearby which got 300 egg-bearing lobsters out of the 500 traps hauled. These results suggest that egged lobsters do not turn up in large numbers in trawls, but are caught in large numbers in traps, just as the fishermen have said. If this is any indication, the NMFS scientist have under-reported the population of egged lobsters because they are using the wrong technology.

Second, Dr. Yong Chen, a population dynamicist, employed by DMR and the University of Maine, is beginning to study the Federal model with a view toward making improvements in it. In addition, other lobster biologists, including Professors Robert Steneck and Cathy Castro, are arguing that additional data and variables need to be considered in the Federal model, such as water temperature and changes in habitat (American Lobster Stock Assessment Sub-Committee 2000). In short, discussion of the Federal model is at long last being opened up and the work of the modelers subject to the same kind of peer review that is common in academic circles. These

studies will almost certainly result in improvements in the model, and better data being put into them.

Politics and the Interpretations of Biologists

Several different kinds of social and cultural factors also influence the quality of the science. Government agencies and their scientists can be notoriously secretive about their activities. Position papers are often kept in house, and the data and models used in lobster management are closely guarded.

Much of the work on which lobster management is based, including the critical models, are never published, and consequently they are never subject to peer review. Scientists in the National Marine Fisheries Service and the states are often not involved in the critical give and take of the publishing process which helps to improve the quality of academic papers and ensures that the worst work is not published at all.

Second, state and Federal scientists become wedded to the models and scientific findings and the science behind them. They often work on the same model or problem for years on end. In some cases, their entire career is tied up with a particular line of research and the policies stemming from it. Some of those involved with the Federal lobster model have been working with various versions of the same model for more than a decade. Some of the state and Federal biologists did studies on lobster sizes, sexual maturity, and egg production decades ago. These studies led them to the conclusion that the best way to conserve the stock was by increasing the minimum gauge. Several have devoted much of their careers to furthering the cause of increasing the minimum gauge. Devoting one's career to furthering a policy does not lead to the kind of skepticism and open mindedness that produces the best science. Quite the contrary, it can

lead to avoiding asking questions and doing studies that will produce unwanted results, or even in suppressing data that might be used by the industry and administrators to further what the scientists consider damaging policies. The Federal modelers produced no studies of the effect of the V-notch and oversize laws on egg production in the 1980's and 1990's. Then in 1997, Jim Wilson of the University of Maine produced a model showing that the V-notch and oversize greatly affected egg production. Three years later, the Federal model was modified to include the V-notch and oversize(Lobster Technical Committee 2000). I have long suspected that variables concerning the V-notch and oversize never were included in the model because the Federal scientists "knew" in advance that these policies were ineffective for reasons we have already explored. Only when some independent evidence was produced and conveyed to the ASMFC representatives from Maine did they consider such variables.

Last and most important, lobster science has become heavily politicized. This is not suggest that lobster biologists are dishonest or crooked. In fact, they are bright, well educated, and devoted to saving the species. The basic problem is that there is a high degree of uncertainty in the science. This means that results of models and other studies are open to a wide range of interpretations. That is, scientists can legitimately interpret the data in several different ways. The interpretation they choose can be strongly influenced by political considerations. One example will demonstrate the point. Between 1997 and 1999, the Lobster Technical and Scientific Committee devoted much of its time to the problem of Long Island Sound. The essence of the issue was that if the Federal model were applied without change to Long Island Sound, fishing effort would have to be drastically cut because egg production figures in that area were a long way from the 10% egg production goal. As a result, representatives from states

bordering on the sound devoted considerable time to attacking the parameters used in the model. Their message was that Long Island Sound was different, and thus the same assumptions about lobster size at sexual maturity, mortality, etc. could not be used here. There is no question that the data could be legitimately interpreted as they said. However, there is little doubt that the motive to change the parameters used in the model was political and economic.

The conclusions of a stock assessment committee are as much influenced by the composition of the people on the committee as by the scientific facts presented. The 1996 and 2000 stock assessment reports are a case in point. The 1992 and 1996 stock assessments were done primarily by committees made up of state and Federal scientists. These people had known each other for years and had been interacting within a closed network. They had generally been committed to the idea that the lobster was over-exploited, that the brood stock was in poor condition, and that effort on the fishery needed to be reduced substantially. Their report said that the lobster was "overfished."

The 2000 stock assessment report (American Lobster Stock Assessment Sub-Committee 2000) reached different conclusions (i.e., that the fishery was growth overfished, but not recruitment overfished). This committee was composed of Federal and state scientists and university faculty members, including some who had been quite critical of the efforts of past stock assessment efforts.

However, the conclusions of the 2000 stock assessment report are not the result of a consensus of the scientists on the committee. This report is a political document, and was produced by a committee that could not reach consensus on many issues in spite months of negotiations. The minority reports contained in the manuscript make it clear that some of the

university scientists on the committee believe the data do not support the idea that the stock is in imminent danger of collapse. The minority reports by some of the biologists from the National Marine Fisheries Service indicate that they feel the lobster stock is in a far more precarious position and are urging a "more precautionary approach" and more regulations (American Lobster Stock Assessment Sub-Committee 2000).

Politics and the Interpretations of Fishermen

On the whole, fishermen have been very astute observers of the lobster and ocean, and have come to many of the right conclusions about the causes of stock fluctuations as we saw in Chapter 7. However, it is very clear that some of their interpretations of events are strongly politicized. The "poverty gauge" and "culturing hypothesis," the most popular arguments advanced by the fishermen for the bust, are excellent cases in point. As we saw in Chapter 7, the evidence does not substantiate either of these hypotheses.

Why do large groups of fishermen espouse ideas that are demonstrably false? Part of the reason is that these ideas have a strong ideological component, and have practical value in the political arena (Geertz 1973).

The poverty gauge hypothesis asserts that the bust of the 1920's and 1930's, was due in large part to a very large gauge which made it impossible for fishermen to keep most of the lobsters they caught. The idea of the "poverty gauge" apparently gained widespread popularity in the late 1960s and early 1970's as a means of countering pressure from biologists to raise the minimum legal size. Raising the minimum gauge was very unpopular with most members of the Maine lobster industry, and the "poverty gauge" myth found favor as a means of demonstrating that large gauges could be very damaging. It is still used in this way by many members of the

industry when the topic of increasing the gauge is broached. Jim Thomas, who did a lot of work on lobsters in the 1960's and 1970's for the DMR, said that he never heard the "poverty gauge" idea raised until the early 1970's when the idea of raising the gauge was first proposed.

The culturing hypothesis was advanced as a cause of the bust long after that event was over. The basic idea behind this explanation is that fishing activity does more good than harm to the size of the stock because lobsters depend on the bait in traps for a high proportion of their food. My interviews suggest it is popular among those wishing to counter the idea that excess fishing pressure automatically causes disaster. One fisherman said: "Severely cutting the number of traps in the water might be the worst thing we could do. It would cut the food supply and bring about the decline in the lobster stock the biologists fear." **(Get exact quote from '98 survey.)**

The idea that the bust was caused by low prices is linked to still another agenda. The essence of the low price argument is that the bust was caused by a flood of Canadian imported lobsters, which caused the price of lobsters to decline to very low levels. The idea had such cachet in the 1930's that Senator White of Maine sponsored a bill in the U.S. Congress to impose a tariff on Canadian imports. Even though the tariff bill never was passed, the idea that the bust was caused by low prices entered the folklore of the industry at this time and has been carried on to the present. Periodically there is a move to limit Canadian imports, the most recent of which was in 1989 when the Mitchell bill was being discussed. On these occasions the low price argument is advanced as a rationale to limit Canadian imports.

To Hell in a Handbasket: Science and the Press

Despite the rising catch levels that have occurred in the past 15 years from the beginning

of the "boom," the press is convinced that the lobster fishery is in desperate straits. Over the past fifteen years, a number of articles have appeared in the national press bemoaning the fate of the lobster and the lobster industry and predicting even more dire things to come. Some of the most notable are "The Dwindling Harvest of Lobsters: 2 Million Traps Have Emptied the Sea" (Lannin 1984); "For A Lot of Mainers, Lobstering Life is Losing Allure" (Kleiman 1991); "Where Have All the Lobsters Gone? (Keiffer 1993). An article entitled "The Lobster Business is Going to Pot" predicted that "Lobstering on the Atlantic Coast would go the way of buffalo hunting" (*Business Week* 1984); one entitled "A Tale of Two Fisheries" lamented that as New England lobstermen "overfish their way to ruin, Australians have profited by becoming conservationists" (Tierney 2000).

By 2000, the idea that the lobster fishery was in deep crisis appeared to be a well accepted fact by the public. The Monterey Aquarium (California) put lobster on its seafood watch list advising the public to stop eating lobster because it was worried "about overfishing and that the fishery could be on the verge of collapse" (O'Leary 2000). An otherwise good public policy textbook uses salmon, Icelandic cod, and lobster as examples of three over-exploited species, and advises that it will require the development of different institutions to conserve them (Bickers and Williams 2001: 122-125).

Attempts to set the record straight have generally not succeeded. In 1991, Dr. Robert Bayer and I wrote the *New York Times* in an attempt to correct several egregious errors in an article predicting disaster for the lobster industry that had been published in that paper. The *Times* did not publish our letter, and we never even received a reply.

Finally in 2000 and 2001, after the boom had been going on for well over a decade, a

series of stories came out that scientists were baffled at the large numbers of lobsters caught when a population crash had been predicted (Baldwin 1998; Daley 2000; Emery 2000). However, these article duly reported that the lobster was "overfished," and that a crash could come at any time. None of these stories reported that the same dire predictions had been made by scientists for several decades, nor did they question the quality of the science.

To some extent, the press campaign can be traced to the industry itself, whose members are notorious for pessimistic predictions. In the industry, it is called "crying." Their boats are always infested with marine worms, and their traps-those few that survived the last gale-rarely catch anything.

However, most of the problem can be traced to the press and the conservative science faction in the state agencies and National Marine Fisheries Service, who provided most of the information for these reporters. The press appears to love disaster stories, and this faction of scientists is all too happy to oblige them. The complexities and uncertainty involved in lobster management apparently do not make interesting reading. More accurate themes for newspaper stories might stress the long political struggle of the industry and legislature to get laws that work, and the uncertainty involved in lobster regulation. One possible title might be "Fishermen struggle for 100 years to put effective laws in place." Another might be "Lobster conservation laws appear to work." But this is dull stuff. "To Hell in a Handbasket" is more exciting. Thus, the public thinks the industry are a pack of villains who have overfished the lobster stock, while record high catches are being produced and members of the fishing industry have put a lot of effort into making the Zone process and the LCMT's work.

Started 3/21/01 Last worked on 4/16/01 Edited by Ann 4/18 - 4/19/01. Bib corrected 4/27.

A lot of changes June 2001 in section on communal action dilemmas, and learning. New bib added

Chapter 9

CONCLUSION

The Maine lobster industry, one of the world's most successful, is distinguished by a sense of stewardship, political support for conservation rules, and effective fisheries conservation legislation. In these respects, it is different from most other fisheries in the industrialized world.

At root, what differentiates this industry is an ability to solve a whole series of communal action dilemmas. Members of the industry have been very effective in organizing themselves to lobby for legislation with the state government to get rules they wanted, and they have had some success in influencing the federal fisheries management agencies (NMFS, New England Regional Council and the ASMFC) to get rules with which they could live. The zone management process has required that fishermen and the state cooperate in producing trap limit and limited entry rules. In other cases, where the government would not or could not act, fishermen have been able to generate rules on an informal basis. Some harbors have been able to provide themselves with informal trap limits. All over the state, fishermen have been able to coordinate efforts to defend territories. In all cases, they have had to overcome a strong tendency for people to free ride on the efforts of others.

Yet in some important senses these are different phenomena. The objective of organizing to lobby the government and to establish informal trap limits is to get rules to constrain one's self and one's fellows for mutual benefit. Most of the people involved agree to abide by the rules.

The rules established are the result of a conscious, deliberate, and completely legal effort - a visible hand process. The territorial system, by way of contrast, is the result of a political shoving match between groups of fishermen, in which rules are established in ways planned by no one. The system that has evolved is the result of an accidental after-effect of this competition. The actions of the Federal fisheries agencies since 1977 involve a different phenomenon still. The federal government has passed certain laws giving Federal agencies a great deal of power to impose rules on the fishing industry in a top down fashion. The industry can do little more than react those initiatives and their ability to influence federal management efforts is far less than is their capacity to get what they want from the State government. Each of these arenas involves a different body of theory, and the data on the lobster industry of Maine makes it possible to contribute to all three. First, I will discuss the contributions of the lobster case study to the theory of the production of rules and communal action dilemmas in general. Then I will discuss a different body of theory applicable to the territorial system. Last, I will discuss how the lobster case study contributes to our understanding of institutional failure, and what it suggests for improving fisheries management.

Rational choice theorists know a good deal about the processes involved in establishing rules or institutions. However, precious little has been done to analyze the development of territories, which are a type of institution, and the rule systems that support them. I will first analyze the development of formal and informal rules, or institutions. Then, I will discuss the evolution of the territorial system. As we shall see, there are differences in the way territorial rules are devised and other types of rules in the industry.

I. Communal Action Dilemmas and Establishing Rules

Scholars interested in the new institutionalism have evolved several different bodies of

literature to understand the development of rules or norms. One group has devoted a good deal of effort to delineating the variables which are conducive to collective action. Their emphasis is on the characteristics of the groups and resources that are likely to give rise to rules and institutions (Ostrom 2000a; 2000b). Another group of scholars has developed a body of theory specifying the types of interactions between people that give rise to rules and norms (i.e. North 1990a; Sugden (1986) and Lewis (1969); and Knight 1992). These interactions can be modeled as different types of games. Still another set of institutionalists has emphasized the historical aspects of developing rules (See Bates et. at. 1998 and Axelrod 1986). I argue that all of these perspectives are necessary if we are to understand the development of rules to manage the lobster. Of special importance, I argue, is political entrepreneurship which is the mechanism driving the rule making process in the lobster industry. I will cover each of these bodies of theory separately and then bring them together in the final section entitled "The Evolution of Rules and a Conservation Ethic in the Lobster Industry".

Prerequisite Conditions Necessary to Develop Institutions. One group of new institutionalists has devoted a good deal of attention to studying the background circumstances allowing groups to devise institutions informally. Essentially, these scholars argue that if the resource and the people involved have the right combination of characteristics, the probability of rules being produced by groups working independently of the government is relatively high. However, they do not specify how those rules come about. As Esther Mwangi says of this school, "The issues concerning why and how institutions change are neglected while the beginning and end points in institutional evolution are overemphasized" (Mwangi 2001).

The efforts of these scholars have gone into developing a number of lists of variables

which they argue give rise to informal or "decentralized" institutions and rules. While there is some overlap in the lists, many variables mentioned by one analyst does not match those of others. Agrawal (2000) points out that Wade (1994), Ostrom (1990), and Baland and Platteau (1996) have contributed the most important analyses in this body of literature. He concludes, "but the most significant issues of method stem from the sheer number of conditions that seem relevant to the successful management of common-pool resources. Wade, Ostrom, and Baland and Platteau jointly identify 36 important conditions. On the whole there are relatively few areas of common emphasis among them. If one compares across their list of conditions, interprets them carefully, and eliminates the common conditions, 24 different conditions are still to be found." (Agrawal 2000: 16). Elinor Ostrom, who has done as much thinking as anyone about the evolution of norms and rules recently came up with the following list of variables affecting the ability to cooperate to produce rules, including "the type of production and allocation functions; the predictability of resource flows; the relative scarcity of the good; the size of the group involved; the heterogeneity of the group; the dependence of the group on the good; common understanding of the group; the size of the total collective benefit; the marginal contribution by one person to the collective good; the size of the temptation to free ride; the loss to cooperators when others do not cooperate; have a choice of participating or not; the presence of leadership; past experience and level of social capital; the autonomy to make bindings rules; and a wide diversity of rules that are used to change the structure of the situation." (Ostrom 2000b: 148). She goes on to list five design principles for "Self-organized Resource Regimes:" (1) "the presence of clear boundary rules," (2) "that local rules in use restrict the amount, timing, and technology of harvesting the resource; allocate benefits proportional to required inputs; and are crafted to take local conditions into account," (3) "that individuals affected by a resource regime can participate

in making and modifying their rules, " (4) "that resource regimes select their own monitors, who are accountable to the users or who are users," (5) "use graduated sanctions that depend on the seriousness and context of the offense" (Ostrom 2000b: 148-151). [we will refer back to these lists innumerable times below].

Mechanisms of Social Change: Three Theories

Another group of scholars has focused on the types of interactions (i.e. relationships between people) which are productive of rules. The most important are those proposed by North and Alchain, Lewis and Sugden, and Knight. All of these theorists assume that change stems from the rational actions of individuals, and that the development of rules or norms will give mutual benefits. Beyond that, their analyses differ greatly.

North and Alchain: Competitive Selection

North (1990a; 1990b) and Alchain (1950) see norms as emerging from voluntary contracts to facilitate exchange. They assert that when people can benefit from an exchange, they must agree on the terms by which that exchange will take place, including rules guaranteeing the compliance of both parties and the sanctions that will be imposed if either party reneges on their duties toward the other. The rules embodied in contracts can benefit both parties even though they are engaged in a prisoner's dilemma interaction. Over the course of time, it is widely recognized that these contracts give superior results, and thus they are adopted widely. In time, they become norms and institutions.

According to North (1990a: 86), institutional change ultimately results from changes in prices. When the price of technology, information, enforcement, or production changes, the parties to an exchange may decide that they can do better with a new contract. Sometimes they can negotiate a new contract within existing norms. In other cases, negotiating a contract may

necessitate changing or ignoring more basic norms or structural principles upon which the contracts depend.

New institutions come into being as a result of competitive selection. Individuals choose to enter into contracts with the goal of overcoming high transaction costs. As a result, they select those organizational forms that reduce the cost of getting the information necessary for negotiating an agreement, negotiating the exchange, and enforcing the exchange. These choices produce a range of organizations. The kinds of organizations that prevail in the long run depend on relative efficiency. Competition will drive out of existence those organizations that are inefficient and thus less profitable organizations, a theme that was first found in the work of Alchian (1950), and later echoed in the older work of North (1990a). The organizations that survive provide maximum joint benefits for those involved in the exchanges, as well as an efficient use of resources for the society.

Lewis and Sugden: The Theory of Social Conventions

According to Lewis and Sugden, the need to coordinate activities gives rise to norms, which are, in essence, social conventions. Lewis and Sugden assume that all actors have an equal amount of power and are involved in a coordination game. Under these conditions, all actors would prefer to cooperate because cooperation gives better outcomes than any non-cooperative solution. In a pure coordination game, "a coincidence of interest predominates" (Lewis 1969:14). A good example of a social convention is driving on one side of the road. Equally good results can be had from a rule specifying that everyone will drive on either the right or the left. Failure to agree on one or the other will result in bad outcomes in the form of high collision rates.

It would presumably be relatively easy for the parties to recognize what the rule should be

if only one equilibrium or solution exists in the game. If two or more solutions are available, the actors might enter into an agreement to select one of them. If they cannot do this, the actors will seize on any salient information in their environment to aid in selecting one of the available solutions. Over a period of time, some of the actors focus on one solution and the others emulate them, which gradually establishes a convention (Sugden 1986:73). Once the convention is established it will tend to be self-reinforcing, since no actor can better his own position by defecting from it (Knight 1992: 99).

Knight: Conflicts Over Distribution of Resources

Knight argues that norms come into being as an aftereffect of strategic conflict over assets and rewards. Knight begins with the assumption that the goal of actors is to attain a reward; rules are created to facilitate that goal. That is, rules rarely distribute rewards equally; they often result in parties or groups gaining differential rewards. In some cases people are fully aware of this and consciously lobby and maneuver to create rules that will give them a distributional advantage. In other cases, rules are generated as the unplanned byproduct of a struggle over rewards, or of attempts to resolve conflicts over rewards. In both cases, the goals of actors are to obtain resources; the rules that emerge facilitate this goal.

The rules are created through a process of negotiation. The parties involved have different amounts of power in the negotiations because they have different assets. The actors with more assets have a distinct advantage in the negotiations because they are in a position to accept more risk, because they have more withholding power, and because people are less willing to sanction them if they violate a norm. As a result, the rules that result from negotiation sessions are apt to favor the more powerful; the less powerful have no option but to accept those rules since they cannot do better (Knight 1992:128). If the creation of a rule is the result of a

centralized, collective decision-making process, the resulting rule will reflect the asymmetries in the actors' resources. That is, we would expect those with more resources to succeed in negotiating the establishment of a rule beneficial to themselves.

If the norms come about via an informal or "decentralized" process, we would expect a different sequence of events to occur. Over time, actors with more resources will be able to resolve negotiations in ways favorable to themselves. Others with similar resources will be able to do the same, establishing a pattern. As people recognize that they are dealing with someone with superior resources, they will adjust their strategies to achieve their own best outcomes. In time, they will alter their strategies to converge on a particular outcome, thus establishing a norm.

Of these three theories, only Knight's will help to explain the development of a large number of rules and institutions. As we shall see, virtually all of the interactions and negotiations leading to the development of rules for the lobster industry involve conflicts over who is going to get the lobster resource. The theory of *social conventions* is only useful in explaining the development of one rule, namely the escape vent. There are no instances in which rules were developed as a result of *competitive selection*.

Key Variables in the Production of Rules

There are undoubtedly a large number of variables that play some role in producing rules for the lobster industry, but a few appear to be of crucial importance. Many of these have been mentioned by Ostrom (2000b) appear to be of key importance in allowing the harbor gangs-particularly those on small islands (see chapter 3)-- to devise rules informally. Most of these are associated with the harbor gang organization and closely associated territorial system. Most island harbor gangs are relatively small in size. The numbers of people involved is small.

When these people are at sea, they are fishing the same small patch of ocean and are always within a few miles of each other; they see each other's boats for hours on end each day that traps are being pulled.

The small island harbor gangs have a **sense of community** and have developed a good deal of **social capital** over time. On these islands members of harbor gangs interact with each other continually and know each other well. People know who can be trusted and who is likely to cause problems. Those in small, isolated harbors are very dependent on each other. Even mainland harbor gangs are composed of people from the hamlet adjacent to the harbor where the boats are moored; the rest come from the immediate area. Even in these larger gangs, most people know everyone in the gang at least by reputation, and they depend on each other for help in emergencies. Harbor gangs are also reference groups. These are the people with whom one identifies and compares one's self. They are people whose opinion matters.

It is exactly these kinds of social units that are most likely to be able to develop and enforce rules (North 1990a: 12). The small size of territories and the proximity to each other makes it easy for fishermen to monitor each other and discover who is violating norms. Sanctioning violators is more effective as well. One thinks twice about violating rules when that will mean alienating long-standing friends and work groups whose opinion one values and on whom one is dependent. Moreover, the high degree of interaction facilitates the production of rules. There is a lot of evidence that face to face communication "produces substantial increases in cooperation" (Ostrom 2000b: 140; Ostrom and Walker 1997). All of these social factors buttress both the informal rules and the conservation laws and make them virtually self-enforcing. The intense interaction that marks so many harbor gangs facilitates consensus on laws which members would like the legislature and zone councils to pass. When people are able to

devise or influence the rules, as Ostrom points out, they are more "likely to manage local resources more sustainably than when rules are externally imposed on them" (2000b: 148).

These island harbor gangs are relatively **homogenous**. They use the same technology, and are members of the same sub-culture with all that indicates about shared values and ideas. Members of gangs do differ in the number of traps used. In mainland harbor gangs, the operations of full time fishermen and part-time fishermen are quite different in this respect.

The island harbor gangs (Chapter 3) have perimeter defended **boundaries**, and there are **barriers to entry** into those gangs. Both are important for the generation of informal conservation rules. Rules can only be applied in an area; and if they are going to be enforced, the areal boundaries must be maintained. There is little sense in a group devising rules to conserve the resources in an area if free riders can enter the area and gain the benefits of conservation efforts to which they have not contributed.

The entire lobster industry assumes a **low discount rate**. Lobster fishermen have come to assume that reasonable numbers of lobsters will be available. Since 1947, the lobster catch has been remarkably steady except for the period from 1988 to the present, when catches have been phenomenally good. In the small island harbor gangs with perimeter defended areas, fishermen are assured that they will not have to share their largesse with new entrants to the fishery. Under these conditions, one can afford to sacrifice present catches for future gains (Ostrom 1990: 34-35). Conservation rules make less sense if future returns are more problematic due to the probability of stock failure or actions of other fishermen.

Two additional factors are critical for the generation of both informal and formal rules. One is the existence of **distribution fights**. Virtually every lobster conservation or management rule came about as a result of a fight between various factions over control of the resource. In

Chapter 4, we saw that the first size limits and the prohibition on taking egg-bearing females came about during the course of a vicious fight between the canners, who wanted to take any size lobster, and the live lobster industry, which wanted lobsters conserved until they could be sold as dinner lobsters. The double gauge law was the result of a struggle between the fishermen in the western part of the state, who were allied with the dealers and Commissioner Crie against fishermen in the eastern part of the state. What was at stake here was control over export, with the fishermen in the west wanting to increase exports of lobsters to other Atlantic coast states, while fishermen in the east wanted to prevent an avalanche of imported lobsters from Canada which, they feared, would lower the prices they received. Chapters 3 and 5 revealed that the motive to get a trap limit was a desire on the part of small and medium-sized fishermen to increase their catches and incomes by getting rules to constrain those with large numbers of traps. In Chapter 5 we saw that the zone boundary disputes were rooted in a conflict over access to productive lobster bottom; while the struggle over the limited entry rules was fought over who would get access to the lobster at all. Chapter 6 described the decades-long resistance of the Maine lobster industry to efforts to increase the minimum size measure to 3.5 inches CI, which was rooted in the fear that increasing the minimum measure would result in an increased share of the market going to other jurisdictions, including Canada. The conflict between Maine and the outer Cape Cod lobster concerns whether V-notched lobsters will be conserved, as was agreed in Amendment 3 of the ASMFC, or whether fishermen south of Cape Cod will be permitted to take them. Every one of these issues involves a dispute over rules that will have a differential affect on people's income. It would not be far wrong to say that rules in the lobster industry are the result of distributional issues. One exception is the trap limit which is essentially coordination game. The other exception is the V-notch, which falls into no easily definable

pattern.

The other factor influencing the generation of both informal and formal rules in the lobster industry is **political entrepreneurship**. I argue that this is one of the crucial variables. Literally none of the informal rules or conservation laws were put in place without some person, or a very small group mustering support in the industry and/ or lobbying officials. These individuals often had to work for long periods to change the values and attitudes of large numbers of people. People such as Sonny Sprague and Alfred Stanley worked for years to negotiate informal trap limits on the islands where they live. Biologist Francis Herrick and Commissioner Horatio Crie were instrumental in getting support in the industry and legislature for the double gauge law which was finally passed in 1933, after literally decades of discussion and debate. MLA President Eddie Blackmore and DMR Commissioner, Spencer Appolonio, lobbied mightily for the escape vent law of 1978, and against the rise in the minimum gauge in 1985. It is very unlikely that the Zone Management Law, and the concept of Effort Management Teams and LCMT (lobster conservation management teams of Amendment 3 of the ASMFC) had people such as Commissioner Robin Alden, Commissioner Bill Brennan, and MLA Executive Director Pat White not changed people's ideas about co-management. Hardin (1982: 35-37) argues that entrepreneurs must be present if latent possibilities are to be turned into rules. This certainly appears to be the case in the Maine lobster industry.

Producing Rules for the Maine Lobster Industry

Rules for the Maine lobster industry came about when a complicated set of conditions were met. In all cases, political entrepreneurs played a key role, and in all instances one of the mechanisms producing social change were present. In most cases, the mechanism was a

distribution fight of one kind or another. Both political entrepreneurship and a certain type of interaction were necessary..

But to argue that political entrepreneurship and the mechanisms of social change are the key variables is not to deny the importance of the prerequisite conditions. It is the prerequisite conditions that make it possible to generate rules informally ("decentralized"). That is, if the community is small, homogeneous, with a strong sense of community, and the harbor gang can keep interlopers from taking the lobsters in their area, then political entrepreneurs are likely to have a high probability of being able to persuade other members of their harbor gang that enforcing local rules is in their own best interests. If those prerequisite conditions are not present, then political entrepreneurs have no other recourse than to approach the legislature to get those rules. In Chapter 3, it was argued that informal trap limits were essentially the product of a distribution battle between fishermen with a lot of traps and fishermen with small and medium-sized operations who wanted rules to constrain the "big fishermen." Those with the smaller operations in most of the harbors of the state had the political power to make and enforce trap limit rules. However, these informal trap limits only came into being on a few islands with a number of prerequisite characteristics, including perimeter-defended territories and limited entry rules, small size, a strong sense of community and a lot of social capital, a low discount rate, and a high dependence on the resource. The other harbor gangs in the state had to wait decades before the leadership of the Maine Lobstermen's Association could persuade the legislature to act.

When are people able to devise rules in "decentralized" fashion as opposed to approaching the state (i.e. centralized)? The answer to this question is found in the existence of the prerequisite conditions stressed by Elinor Ostrom (1990), Wade (1994) and others.

When a group of people want a rule, but their communities do not have the right combination of

characteristics to get one informally, they have no choice but to do without the rule or approach the state to supply it. In this sense, the state is a substitute for the kinds of social characteristics which would allow people to generate rules informally.

Social scientists appear to consider 'centralized' and 'decentralized' solutions to communal action dilemmas as very different phenomena. Rules generated by the state are normally studied by political scientists, while those produced informally [decentralized] are in the purview of anthropology and sociology. However, the case of the Maine lobster fishery points out that the circumstances surrounding the production of both may be very similar. It might take very little for a group that had been trying to get a rule informally to turn to the legislature.

Cascading Communal Action Dilemmas

Solving one communal action dilemma often involves the solution of others. Two different kinds of phenomena are involved. First, in some circumstances one cannot solve one communal action dilemma until others are solved first. The result is a type of cascade of rules in which the solution of one problem depends on the prior solution of others. In Chapters 2 and 3, we saw how informal trap limits could only be devised in those few island communities which had managed to devise strict limited entry rules, as well as having perimeter-defended areas. The perimeter-defended areas, in turn, could not be maintained unless a political team was organized to defend those boundaries. Each one of these types of problems could not be solved unless people overcame the tendency to free ride on the efforts of others and devised rules to constrain themselves. Fishermen could informally devise trap limit rules only after two previous collective action dilemmas had been solved. Organizing the political team for boundary defense is a first

order collective action dilemma; devising limited entry rules and boundaries is a second order collective action dilemma; devising the trap limit rules is a third order collective action dilemma.

Second, in other circumstances, solving one collective action dilemma, passes externalities on to other people, who, in turn, demand rules to solve the problem created by the first rule. This can create another type of cascade. Chapter 5, for example, describes the way in which trap limits were created by the zone councils, which passed costs onto the "big fishermen" and benefitted the "small fishermen." The big fishermen, in turn, demanded rules to constrain the small fishermen. The result was limited entry rules passed by the zone councils and rules to limit the speed with which "small fishermen" could add to their trap numbers. Limited entry could not be effective if people could fish in the waters of other zones. Thus, Commissioner LaPoint of the DMR passed the so called "49%/51% rule. This, in turn, caused conflicts over boundaries, which are only being solved in 2000 and 2001 by the Zone Councils and the DMR negotiating "buffer zones." No doubt, the buffer zones will cause problems for some groups of fishermen, who will demand still other rules to solve them.

The Evolution of Rules and a Conservation Ethic in the Lobster Industry

One of the most remarkable features of the Maine lobster industry is its strong conservation ethic. Fishermen are genuinely concerned with the state of the resource, and have supported legislation to conserve that resource and efforts to enforce those laws. Under the right conditions, as we saw in Chapter 3, some groups of fishermen have been able to generate rules informally. It is this sense of stewardship that separates the lobster fishery from so many others where fishermen have a "goldrush" mentality.

How did this sense of stewardship come into being? I argue that it represents genuine

culture change which occurred as a result of technological, biological, historical, and social factors interacting and reinforcing each other over the course of much of the 20th Century. To be sure, the conservation ethic has an ideological element. Like all aspects of culture, the conservation ethic is a set of ideas that exist in the symbolic realm. But changes in this cultural system are the result of long term experience of people in the industry. It is a very practical adaptation to the world in which they live. It is also part of an evolutionary process, in which the people of the lobster fishery are reacting to and affecting the environment in which they exist.

There are several aspects of the lobster fishery that should have made it easy to develop conservation rules. Rational choice theorists argue that the nature of the resource and the technology in use themselves can affect the development of rules (Ostrom 2000a; Schlager, Blomquist and Tang 1999). Certainly, technology and biology have made it easier to manage the lobster fishery than other fisheries. Lobsters can be brought to the surface and returned to the water without harm. Moreover, one can see the reproductive status of lobsters. Eggs attached to the belly of a female lobster are obvious to all. In addition, lobster traps are highly selective. What this means is that a lobster trap can be pulled to the surface where the legal-sized lobsters can be retained while the illegal ones (juveniles, egged females, oversized, and notch tailed lobsters) can be selected out and released unharmed. By way of contrast, fin-fishing technology is far less selective. A very high percentage of the fish caught in otter trawls come aboard dead, and gillnets kill a sizeable proportion as well. Fin-fishermen cannot return undersized or egged females to the water. Even if fin-fishermen wanted to return egged females to the water, they would have difficulty selecting out an appreciable percentage of such females. Even if one could tell the females with eggs from others, most would be dead by the time they got on deck, either smothered in the cod end of a net or killed by a burst swim bladder.

Moreover, *social and organizational factors* of the lobster fishery should make it relatively easy to enforce rules once they are in place. After all, the entire Maine lobster industry is organized into small harbor gangs whose members have interacted over long time periods and are dependent on each other, and they know who can be trusted. Individuals can relatively easily monitor each other's behavior. All of these factors make defection from norms less advisable, and facilitate sanctioning people who do (Ostrom 1990, 2000a, 2000b). In addition, the lobster industry is relatively homogenous. Even in mainland harbor gangs, lobster fishermen all use boats in a narrow size range with much the same electronic gear and operate with one or two-man crews. They all use traps to fish inshore waters on one day trips. As a result, rules proposed for the lobster industry are more likely to give a much higher percentage of fishermen the same costs and benefits, which means they are less likely to generate opposition from disadvantaged license holders.

Moreover, the *kinds of rules* that have been put in place in the lobster fishery are favored by the industry and fit fishermen's ideas about the way the ocean works. As we have seen in Chapter 7, Lobster fishermen see the ocean as one in which fish stocks can change rapidly and unpredictably in response to a myriad of environmental and biological factors. From their perspective, the best kind of rules are those that protect the fish in critically important parts of their life cycle—during reproduction, migration, spawning, nursery grounds—by enacting rules about how to fish (i.e., rules concerning when, where, and with what technology). [We call these "parametric rules" (Wilson et. al 1994; Acheson & Wilson 1996)]. As we have seen in Chapter 4, most of the conservation rule are of this type. In large measure, the success the lobster industry has had in putting into place parametric rules is due to historical accident. These rules were put in effect when the fishery was completely controlled by the State of Maine. In the past

70 years, many of these laws were put in place by people who remembered the "lobster bust" of the 1920's and 1930's, long before scientists, enamored of stock-recruitment models, had much influence on legislation. After the passage of the Fisheries Conservation and Management Act of 1977 and the Sustainable Fisheries Act, the Federal bureaucracy, advised by scientists trained in population dynamics, was given enormous power to manage fisheries. Scientists and managers pressed strongly for rules that made "scientific" sense, but which the industry was sure would be costly and ineffective. So far, the industry has prevailed and has managed to retain rules it favors (i.e., the V-notch and oversize measure) and avoid having less sensible rules imposed (i.e., an increase in the minimum gauge or a quota system).

There can be little doubt that the biological, technical, organizational, and historical factors discussed above have made it easier to formulate effective, enforceable rules for the lobster industry. Nevertheless, it is easy to make too much of these factors. After all, none of these factors has changed much from the beginning of the century to the present. In the lobster industry, the biology and technology, harbor gang organization, and the general nature of lobstering rules have not changed from 1900 to the present. Throughout the century, lobster management has been based on rules designed to protect small lobsters and the breeding stock. What has changed is the compliance with these rules. Before and during the period of the lobster bust, the rules were extensively violated. For example, taking undersized lobsters and scrubbing eggs off females were both illegal, but were not really considered crimes by the fishing community or the courts. Over the course of the past 60 years, the growth of the conservation ethic has resulted in the industry's successfully lobbying for additional rules, and compliance with the new and existing rules has grown to the point where they are virtually self-enforcing. The key question is why the lobster industry changed from violating the conservation rules to

supporting them and adding more.

I argue that ideology, rules, and changes in catches, along with biological, technical, and organizational factors affected each other in an interactive way to produce what we call the conservation ethic, a massive change in the culture of the industry. In the 1920s and 1930s, the extensive cheating in the Maine lobster industry meant that people obeying the rules were doing neither themselves nor the resource any good. Under these conditions, it was all too rational to defect from the rules. The painful experience of the lobster bust of the 1920s and 1930s caused a change in people's perceptions about the value of the conservation laws. Many became convinced that cheating was doing a good deal of damage to the resource and that compliance with the rules would result in collective benefits. An increasing number of these people began to obey the rules themselves and began to report flagrant violators (Acheson 1997: 8-10). Arguments in favor of conservation were buttressed by the modest increases in landings that occurred in the late 1930s and early 1940s.

After World War II, many (but not all) returning veterans became convinced that conservation would benefit the resource. They wanted to make a living in the lobster industry and did not want it to return the dismal conditions of the 1930s. Eddie Blackmore, past president of the Maine Lobsterman's Association, stated "Many people came back from the war and wanted to go fishing. We knew that if we took care of it [the fishery] it would be there." In the late 1940s, many fishermen convinced themselves and others that the fishery would be enhanced by having more eggs in the water, and that the best way to accomplish this goal was to voluntarily support the V-notch program. The popularity of V-notching grew continually from the late 1940s onward.

Success fed on success. During the 1950s, 1960s and 1970s catches were very stable,

averaging 20 million pounds, three times what catches had been in the lobster bust years of the 1920s and 1930s. The stable catches hardened the conviction of many fishermen, including industry leaders, that their view of the ocean was correct and that the lobster conservation laws were effective and were playing a key role in producing relatively high catches and incomes for them. This conviction, in turn, led to increased efforts to sanction those who violated the law. "Bandits" now had an unsavory reputation in coastal communities, and fishermen increasingly felt justified in helping the wardens get evidence against them. Taking "shorts" [undersized lobsters] was now viewed by most as a crime, not a necessity.

The increased faith in conservation regulations led to the development of further regulations. In 1978, the industry supported legislative initiatives for an escape vent law, and in 1995 the Zone Management Law (a co-management initiative) received excellent support from the industry. The record high lobster catches experienced from the late 1980's on have buttressed belief in the effectiveness of the conservation laws, and in the view of the ocean which made them seem so sensible. Many lobster fishermen now are convinced that the success of the industry is due, in great part, to their own effort in supporting passage and enforcement of conservation laws.

In summary, the rules that have solved the collective action dilemma for the lobster industry are the result of a 70-year-long process in which stable and higher catches have buttressed faith in lobster conservation laws and reinforced a view of the ocean and the lobster on which those laws are based. This faith in conservation, in turn, has led to passage of more parametric laws and increased support for enforcement efforts. Once the upward spiral began, technology, biology, social organization and the parametric nature of the rules helped to continue it. The selective gear (i.e., traps), and the biology of the lobster made it possible to put juveniles

and breeding-sized lobsters back in the water without harm, bolstering stock sizes, while the harbor gang organization made it easy for fishermen to monitor each other and aided enforcement of the rules. Changes in practice, values, catches, and a view of the ocean all worked to reinforce each other over the course of decades in a way that has allowed this industry to solve its communal action dilemmas to get desirable legislation and ward off less desirable rules.

In the literature, there are few examples concerning the way in which rules were developed due to the interaction of multiple variables over the course of decades. However, events in the lobster industry are not unique. Axelrod argues that norms evolve over time in a process in which success plays a crucial role. "This approach is based on the principle that what works well for a player is more likely to be used again while what turns out poorly is more likely to be discarded " (1986: 1097). Lin Ostrom expanded on this insight in a conversation with me. She pointed to the "importance of slow but steady changes" in establishing norms. "Instead of creating a big set of rules and trying to get everyone to cooperate under them, it is important to find some new set of rules or norms that people can understand and follow, taking small steps, showing them to be successful and slowly building on that history." The lobster industry demonstrates how those who faced a catastrophic loss in the "Bust", came to recognize some of the problems, make sequential changes, learn from those changes, and gradually develop a sustainable industry over the long run. Robert Bates and his co authors (1998) describe a number of other historical cases that are similar in many respects.

A warning needs to be sounded however. If upward spirals are possible leading to increased conservation, downward spirals are also possible. It might take very little to tip a system from one to the other. In the lobster industry where people are relatively sure that the

resource will be there in the future, and the results are well enforced by both the wardens and other fishers, people do not defect from the rules. However, where discount rates are high and enforcement is less certain, people compete to get as much of the resource as possible, and a tragedy of the commons ensues. Chief Warden Joe Fessenden points out that this has occurred recently in the Maine scallop and groundfish industries, which are currently in very poor condition.

II. Territoriality and Rules

The territorial system is the root institution governing the lobster industry, making possible the generation of other kinds of rule systems. Despite the fact that every society makes territorial claims on the land it occupies, and large numbers of fishing societies have systems of riparian rights (Acheson 1981; Acheson and Wilson 1996; Schlager 1994), there have been comparatively few analyses of how territorial systems come into being and change.

Several important features have influenced the way the system has evolved. First, the system of lobster territories is an encapsulated system (Bailey 1969), a political system within another political system. Each of these systems operates according to different principles, and each have made some accommodation to the other. In the lobster industry, the state wardens give tacit recognition to the system and are inclined to "let fishermen settle matters among themselves," as long as the loss of property does not become excessive. When it does, they will prosecute those cases. The industry for its part keeps the amount of violence to a minimum.

Second is the system of social relationships involved in the territorial system. Alan Page Fiske (1991) argues that there are four elementary forms of human relations, which he calls communal sharing, authority ranking, equality match, and market pricing. None of these comes close to describing the territorial system. There is still another basic system of relations—a threat

system. These are systems where social relationships are ordered through the threat or actual use of force. The outcomes depend completely on the decision of combatants to fight or submit. As Boulding (1963) has pointed out, threat systems are very unstable. Once one party defies another or uses force, it is difficult to predict what will happen. Conflict can quickly escalate into a confrontation in which both sides can lose heavily.

The territorial system of the Maine lobster industry is a threat system used to regulate access to ocean territory. It is an informal system of rules, none of which are enforceable by third parties. Like all threat systems, it is highly unstable. There are two sets of rules which should be distinguished: boundary rules defining where different groups of fishermen have rights regardless of how temporary; and rules-of-the-game defining how these territorial rights are to be defended, or new territories generated.

No system of rules will exist for long if they cannot be enforced. In Maine, violations of the territorial rules could be enforced at low cost. Most anyone could get away with sanctioning violators of territorial "boundaries" if they used minimal care. It is entirely probable that the territorial system would not have come into being at all if the costs of sanctioning had been high. Indeed, in the past 20 years when the activities of the warden force and changing values in the industry have resulted in more law enforcement, the costs of informal enforcement have become much higher, with the result that the entire territorial system is changing and may go out of existence.

In another article (Acheson, and Gardner 2001) we use evolutionary game theory to describe the factors producing changes in the Maine lobster territorial system over the course of 100 years. Our analysis begins with the observation of Demsetz (1967) who argued that territories are established when the benefits of maintaining territories outweigh the costs. This

theme is echoed in the work of Dyson-Hudson and Smith (1978) and others. This important insight helps to illuminate the conditions under which territoriality was established in the Maine lobster industry. Territorial rights are established when it is worthwhile for groups of fishermen from one harbor to dislodge people from other harbors from fishing in an area. What is unusual about the lobster industry is the large number of variables affecting costs and benefits of territorial defense and offense, and the fact that these factors can combine in ways that produce at least three different patterns of territorial usage. No single factor by itself consistently results in territoriality.

In the lobster industry, the primary factors influencing the decision to defend or invade an area are the value of the fishery and trap congestion. In areas where catches are not high, and traps are placed so far apart they do not subtract from the catches of others, no territorial rights develop. As a result, no territorial rights have ever evolved in offshore areas, nor did they evolve in the middle of large bays before 1940.

Even if the resource were valuable and traps were congested, no territorial rights developed if the costs of invading and maintaining rights to the area were excessive. In addition to the value of the fishery and trap congestion, the decision to defend or invade an area is affected by a number of other factors, including monitoring costs, the costs of transportation, trap losses that occur in trap cutting incidents, and risks of prosecution.

A change in any of these variables can change the costs and benefits of territorial incursion and defense, resulting in changes in boundary lines or the obliteration of all territorial claims. In the 1980's and 1990's, when offshore areas began to be fished by larger numbers of fishermen using a lot more traps, no territories developed there. Traps were not so congested in these deep water areas that what one person caught was subtracted from others' share of the

catch, and vigorous law enforcement made it very risky to indulge in a lot of trap cutting. In the middle of bays, it is likely that for some time there has been trap congestion during the fall months when large numbers of fishermen concentrate their traps in these zones. However, no attempt to develop exclusive territories has occurred here, because any attempt to dislodge fishermen from adjacent harbors would like result in a "Mexican standoff," an expensive fight with no clear winner, or a Pyrrhic victory.

Over the course of the 20th century at least four different changes have strongly affected the costs and benefits of territorial incursion and defense, tipping the decision to defend or invade areas in different ways in different stages. These changes are: trap escalation, new technology, increased law enforcement in the last 20 years, and ecological changes that increased the lobster catches on mud bottom in deep water fished in the winter.

There are several aspects of the lobster territorial system about which current theory provides few insights. Despite the fact that there is no means of settling disputes once they are started, the amount of violence is relatively low. What maintains the peace in this system is not completely clear. Some clue to the answer might be found in the work on territorial systems maintained by the threat of force that have been described in some detail in Africa and in other parts of the world. In those societies, several mechanisms have been identified as maintaining order, including a system of "conflicting allegiances" (Gluckman 1956).

Another question concerns the lack of political alliances between harbor gangs. In large numbers of systems around the world where relationships between groups are dominated by the threat of force, groups in conflict will form alliances with other groups against a common enemy. The most famous of these systems are probably those described by Evans-Pritchard (1969) among the Nuer of the Sudan and by Barth (1959) for the Swat Pathans.

The operation of the political teams that are involved in territorial defense and invasion is a virtual mystery. Who assumes the leadership roles of such teams? How do they attract a following to engage in territorial defense or invasion and persuade people to avoid being free riders on the efforts of others? Answering these questions presents an opportunity to make some contribution to our understanding of threat and territorial systems in general.

III. Policy Failure and Success

The success of Federal programs varies considerably. Some programs work well, and the agencies that run them are highly efficient. Few people these days would want to do away with the social security system. Moreover, the Federal government has done jobs that the states could not or would not do themselves. A prime example is in ending discrimination against Blacks. But in vast areas, centralized control by the Federal government of the U.S. has not been very successful. This certainly includes Federal management of fisheries in New England under the Regional Council system.

Efforts of some branches of government to manage the lobster industry have met with marked success; while other efforts by other government units have been notably unsuccessful. On the whole, the interactions of the lobster industry and the state of Maine have resulted in a number of laws that are successful. To be sure, the negotiations and maneuvering that led to the minimum size measure, the prohibition on taking egg-bearing females, and the double gauge rule were distinctly acrimonious and dominated by distributional concerns, but the rules that resulted appear to be effective in conserving the resource. The Zone Management Law has clearly been the most successful state law, in that it quickly led to both trap limits and limited entry rules for

most of the zones.

Efforts by the Federal government to manage the lobster fishery have been far more mixed. The New England Regional Council and National Marine Fisheries Service failed to produce a lobster management plan that would get political support in the industry. Their attempts to increase the minimum gauge, and do away with the V-notch and the oversize measures led to years of political stalemate. These attempts did nothing so much as pose another collective action dilemma for the industry—a problem to be overcome by collective action.

After 1995, when primary authority for managing the lobster in Federal waters was assumed by the Atlantic States Marine Fisheries Commission, management efforts have gone ahead much faster. Amendment 3 to the ASMFC lobster management plan was adopted in 18 months, and all of the areas are on track for imposing regulations to meet the egg production goals specified by this plan. Still, ASMFC management leaves much to be desired in the view of many industry members. One serious problem came to the fore in 1998 when the ASMFC plan (Amendment 3) was almost superseded by the National Marine Fisheries Service operating under the Sustainable Fisheries Act. Another stems from the fact that ASMFC management is based on stock assessments, which give conflicting results. If the 2000 assessment is correct, then the lobster is growth overfished, but not recruitment overfished. Why, then, industry members are asking, do we need to meet *egg* production goals when recruitment is adequate, and there are enough eggs in the water to maintain the stock? These are important and fair questions.

In short, if we want to assess policy success, we need to look at Maine State management, particularly the Zone Management Law. If we wish to understand policy failure, we want to focus on Federal management—especially management by the Regional Council between 1977 and 1995.

The literature on policy failure and success is large and especially confusing. A very large number of explanations have been offered for cases where the government does not do its job, but no overarching body of theory has emerged integrating these into a coherent whole. Policy failure is a number of diseases, not just one.

One problem is that there is no consensus in this literature on how policy failure is to be defined? Singleton points out that anthropologists tend to define resource policy success in terms of policies that prevent unsustainable exploitation levels. The problem with this definition, she writes, is that many factors can affect sustainability, including a host of environmental factors. Thus a resource may succeed or fail for reasons that "would be unrelated to institutional design."(1998:26).

In my opinion, Taylor's insight into the nature of government gives us the best way of defining the success and failure of governments. He states that "politics is the study of the ways of solving collective action problems" (Taylor 1990: 224). If this is the case, governments fail when they cannot solve collective action problems facing them, or do not permit others to solve them. However, failure or success is a relative phenomena. Success or failure must be measured in terms of its effects on the costs of devising rules to manage resources. A failed government or agency is one that in raises transactions costs to the point where people can only devise inadequate rules at great costs in time and effort, or are prevented from devising resource management rules at all.

If we define "government failure" in this way, a number of ideas in the literature on government and policy failure help to explain what has occurred in Federal management of the lobster industry.

Some very eminent social scientists argue that government inefficiency can be the product of deliberate design. Moe (1990) argues that laws and government agencies are designed by politicians, who know that their hold on power is tenuous and that the opposition can be in power in the near future. They deliberately design government institutions to be inefficient to avoid having an efficient invention of their own making used against them when they are out of power. North points out that inefficient institutions can persist when they serve the interests of those in power. "Put simply, if the state has coercive force, then those who run the state will use that force in their own interest at the expense of the rest of the society" (North 1990a: 59). Sometimes it serves the interests of rulers to allow inefficient institutions to exist, including monopolies, barriers to entry, featherbedding rules, etc.

A number of authors assert that the problems of governments stem, in the main, from the behavior of politicians and government officials who opt to serve their own interests rather than those of the public (Cook and Levi 1990: 411; Moberg 1994; Shleifer and Vishny 1998: 4). These activities can range from voting for the interests of constituents in ways that do not serve the public at large to outright bribery and corruption.

Others see the problem in terms of rent seeking, which occurs when an interest group "colonizes a government bureau so that the bureau promotes the specific interests of the organized group at the expense of the public as a whole" (Bickers and Williams 2001: 194). Both politicians and bureaucrats are motivated to permit such arrangements. Politicians wish to serve valued constituents; bureaucrats are happy to have powerful legislators favorably disposed towards them and their agency.

Buchanan and Tullock (1962) suggest that many problems stem from winning majorities

that pursue wasteful policies of redistribution. Olson (1965) and Becker (1983) assert that interest groups pressure forces the government into redistributing goods and services to them at enormous cost to the public. Scott (1998) argues that the most devastating failures of policy have occurred when autocratic governments have foisted "high modernistic" schemes, ostensibly based on "rationality" and "science" on a public that was powerless to resist. A number of authors, including Miller (1992: 140-142), Williamson (1970: 25-27), and Tullock (1965: 142-93) have argued that all bureaucracies, including those of the government, have problems with asymmetrical information. That is, as information is transmitted from the bottom of a hierarchy to the top it is simplified and distorted, often to cover mistakes and incompetence of officials at lower levels. Thus, top executives are making decisions based on faulty information. In all of these cases, the design of institutions or the behavior of public officials works to raise transactions costs in ways that make it difficult to solve communal action problems to benefit the greater public.

Some of these ideas help to explain the failure of Federal fisheries policy, and some of the actions of the Regional Council, but none of them fits the case precisely. For example, a variation on rent seeking took place. Most of the membership of the Regional Council were ground fishermen who wanted to impose rules favorable to their section of the industry. On occasion, this meant fighting measures proposed by other industry sections because they would disadvantage the groundfishery, even though it would help the cause of conservation in the fishery whose members proposed the rule. A good example is the Council's refusal to pass rules outlawing dragging for lobsters, a proposal much favored by the lobster industry. The policies of the Regional Council can be interpreted as dominated by "interest group pressure" resulting in

"wasteful policies of redistribution." In this instances, the groundfishermen on the Council solved a communal action dilemma at one level, and created another communal action problem for the lobster fishery.

Certainly the information that top officials of the NMFS got from their scientists led them to make poor decisions. But information asymmetries were not caused primarily by incompetence or a desire to cover mistakes on the part of lower level bureaucrats. It stems from the inability of scientists to predict changes in stocks.

The council system was inefficient, and proved unable to produce an effective lobster management plan for 18 years. But the primary reason for this inefficiency cannot be found in efforts to provide rules designed to promote the interests of favored interest groups. Nor was the problem caused by self interested politicians interested in votes and boodle. It was traceable to profound differences in opinion on what was in the best interest of conservation and mistakes in organizing the management agencies.

In all of these instances, bureaucrats and politicians worked in ways that the lobster management rules were inadequate or they could not devise them at all. This is policy failure.

But all of this skirts around the edges of the problems facing management. The basic problem is that this body of literature does not adequately describe what I see as the two most underlying causes of the failure of Federal management efforts. One is the problem with science. The second was imposition of top down, highly centralized management structure to carry out fisheries management policy in the Federal zone. The combination of the two has led to a series of problems with federal fisheries policy. Finlayson (1994) points to the same two factors as causing the mis-management of the cod stocks of Newfoundland in the past three decades. In the

Newfoundland case, the results were devastating. Scott (1998) analysis echos this theme. He argues that the most devastating failures of policy in state societies in general have occurred when autocratic governments have foisted "high modernistic" schemes ostensibly based on "rationality" and "science" on a public that was powerless to resist.

Science, Top Down Management, and Policy Failure

The Problems with Science

We have discussed the problems with science in some detail in Chapters 6, 7 and 8. In summary, the basic problem is that scientists are using stock-recruitment models, which are considered state-of-the-art- techniques. Unfortunately dependence on such models has not permitted fisheries scientists to predict changes in lobster stocks, and has led them to assert that the breeding stock has been overfished. It has induced a crisis atmosphere in which scientists have made extreme predictions of impending disaster, duly reported in the press. It has also led them to ignore the accumulated wisdom of the industry. Of course, inadequate science would have caused no problems had it had no influence on policy. Unfortunately, the work of the Federal scientists shaped the policy recommendations of the NMFS, and led to a number of management proposals in the Regional Council and ASMFC which proved to be very ill advised. A prime example the insistence of the NMFS scientists on raising the minimum gauge. Another is their desire to do away with the V-notch and oversize laws, which are strongly supported in the industry. A third was the plan of the NMFS to force on the industry in 1998 a 475 trap limit- a trap limit far more extreme than the one promoted by the ASMFC. All of these proposals led to extreme opposition by the industry, and to confrontations in which the advice of the NM/FS scientists was repudiated. In 2001, the Federal scientists and administrators are again insisting

that drastic measures be taken to reduce fishing effort in spite of the 2000 stock assessment that concluded that the lobster was not recruitment overfished. As a result, the ASMFC lobster board is sticking with its original egg production goals. This could well lead to another confrontation with industry. The insistence of the NMFS on such policies has seriously damaged the credibility of science and scientists with the industry. What is worse, it is very difficult not to sympathize with the position of the industry in these matters. Inadequate science played no small role in undermining the whole Federal management effort.

Problems with Top Down Management

Ostrom (2000b: 138) argues that one important source of government failure is top down management policies that "frustrate, rather than facilitate the private provision of public goods" and do not get the support of those being governed. This, I believe, lies at the heart of the problem of the failure of the federal fisheries management system.

The Federal system of fisheries management is, at root, a highly centralized, top down management system. To be sure, the fisheries management system is not presented in this way. Federal officials have even used the word "co-management" in describing the Regional Councils' set up under the FCMA. It is true that the Regional Councils do have members representing industry who are appointed by the governors of the states, and it is the councils that formulate management plans. But all of the management plans written by the Councils must be approved by the Secretary of Commerce before they have the force of law. This means, in essence, that the National Marine Fisheries service has the power to second guess all decisions by the Councils.

The Sustainable Fisheries Act passed in 1996 greatly strengthens the powers of the National Marine Fisheries Service and the Department of Commerce. Again, according to this

act, if fisheries are deemed to be "overfished" the stocks must be "rebuilt within 10 years" and the law gives the NMFS enhanced powers to accomplish this task. The NMFS has the power to preempt the rights the Regional Council, the states, and the ASMFC if it is judged that they are doing a poor job in managing "overfished species."

The Atlantic States Marine Fisheries Commission began as a compact of the 15 states bordering the Atlantic Ocean in 1942. In 1993, it too became part of the top down Federal management system when Congress passed the Atlantic Coastal Fisheries Cooperative Management Act making it mandatory for all signatory states to enforce the plans of the ASMFC under threat of having the Secretary of Commerce of the United States place a moratorium on the fishing for species not managed in compliance in the waters of the affected states.

The Marine Mammal Act and the Endangered Species Act are written in very extreme language, and make it mandatory for Federal agencies to take strong unilateral action when such species are threatened. The act does not provide that the costs and benefits can be taken into account in rendering judgements in such cases, nor do these acts allow states to manage these species even in state waters. All lower level governmental units are literally at the mercy of the Federal court system in such matters.

How is top down management working? The answer is that it is not working very well if we can judge from the recent history. Management by the Regional Council resulted in nothing but political stalemate in which no management plan was forthcoming. The NMFS has the authority to approve or disapprove of council decisions. As we have seen in Chapter 7, it used that power in ways that were far from constructive. Repeatedly, the NMFS acted in a very heavy-handed manner, especially in the late 1980's and early 1990's when it attempted force the Council

to increase the lobster minimum gauge and refused to consider other ways of managing the fishery. During the long Amendment 5 fight, it bypassed the Council by hiring outside consultants to write Amendment 5, and even went so far as to set up timetables specifying when the council was to complete certain actions. Repeatedly, it threatened to preempt the power of the council completely as it did by threatening to take over lobster management and write Amendment 6 to the Federal Lobster Plan with no input from the Council. The conflict over Amendment 5 played no small role in convincing the state directors to move lobster management to the ASMFC.

In 1998, the NMFS was seriously contemplating using its powers under the sustainable fisheries Act to preempt the powers of the states and the ASMFC by imposing a 475 trap limit on the lobster industry. In the end, they were persuaded not to impose such a stringent trap limit, but no one questioned their right to do so. Had they imposed this limit by fiat, they would have seriously undermined the authority and effectiveness of the Maine zone management process and the ASMFC.

There is a strong likelihood that the lobster industry will be forced to take very costly action in the near future in efforts to save the right whale, which are likely to be ineffective. Moreover, legal actions to save other species are in the realm of possibility. If the Endangered Species Act or Marine Mammal Act are used to curtail the activities of the lobster industry, a very costly protracted legal battle will almost certainly ensue, in which losses to the industry could be considerable.

The Success of Bottom's Up Management Efforts.

Three efforts by government units to manage the lobster industry have had notable

success. The Maine Legislature has devised a number of conservation laws that have a high degree of support in the industry and appear to be effective, including the double gauge law, escape vent law, and the V-notch program. A second program is the Maine Zone Management Law, which gave the industry has a good deal of authority to devise regulations in important areas. The majority of zones were able to impose both trap limits and limited entry rules within three years after this law went into effect. A third unit that has had success is the ASMFC which was able to devise a management plan and put it into effect (Amendment 3) within 18 months.

All of these more successful management efforts have in common the fact that they have embodied many of the elements of bottoms-up or co-management. Most of the important lobster conservation laws began as bills which had political support by strong factions in the industry; and they were revised with the ideas of industry in mind. The Maine Lobster Zone Management bill embodies a co-management program in which authority to manage important aspects of the industry in each zone is shared between the zone councils and Maine Department of Marine Resources. The ASMFC lobster management program divides the lobster producing waters off the Northeast coast into areas. Each area has a Lobster Conservation Management Team, composed of industry members, who propose management rules for the area.

Why should these bottoms-up management efforts work better? There is, in fact, a good deal of evidence supporting the idea that rules devised by local level units or user groups are more effective at managing resources than those imposed by a top down process (Baland and Platteau 1996; Ostrom 1990: 90, 101; 2000b: 41; Wade 1994: 216). Ostrom (2000b: 148) says: "A frequent finding is that when the users of a common-pool resource organize themselves to devise and enforce some of their own basic rules, they tend to management local resources more

sustainably then when rules are externally imposed on them."

The reasons for this are fairly obvious. If rules are to be effective they must be enforced. When people devise their own rules, they will formulate ones they consider sensible, effective and low cost. They will also frame rules to avoid conflicting with basic norms, which take into account local knowledge, and which are adapted to local conditions. Such rules are in the best interest of the people who framed them, in that they will give the benefits of coordinated action. They are far more likely to obey such rules than those imposed by outside authorities, which, all too often, are framed in ways which impose high economic costs on users, promote conflict, and are seen as ineffective in helping to maintain the resource.

Bottom's up management has another advantage-namely that the management units are small and local in nature. This means that a mistake made by one management unit in one area will have limited repercussions. Moreover, a number of redundant management units each carrying out its own experiment enhances the opportunities to learn about what is effective.

Conversely, a good deal of evidence exists to demonstrate that top down management by central governments is not especially effective. In fact, James Wunsch goes so far as to say that "Numerous scholarly studies have come to this conclusion: the centralized, hierarchical, bureaucratic administrative model has failed. Indeed, to many, it appears to be a wasteful enterprise..."(1999: 244).

Lessons for Management: Co-Management and Parametric Management

If the problem with federal efforts to manage the fishery stem from poor quality science and top down governance structures, the way to solve the problem is to improve the quality of

science and promote co-management. There are serious efforts underway to do exactly this. At this writing there are efforts to improve the lobster model produced by Federal scientists which is being carried out at the University of Maine, and the new trawl survey being conducted in 2000 and 2001 is designed to improve the quality of the data in the model. More important, the entire scientific enterprise behind fisheries management is being questioned and some radically new approaches are being discussed.

Co-management has been successfully introduced in the Maine lobster industry in the form of the zone management initiative. It has also been tried in several different countries with notable success, including Canada, Japan, Norway, New Zealand, and Australia (Pinkerton 1989; Pinkerton and Weinstein 1995). There are undoubtedly many others where conditions will allow people to successfully generate their own rules for management. Almost certainly some of these governments, noting the success of co-management, will follow suit in the near future.

However, it may not be as easy to improve science as we have hoped. Moreover, there are serious impediments to imposing co-management or bottoms-up management, especially at the Federal level. These issues need to be discussed in some detail.

Science, Uncertainty and Parametric Management

The problems that fisheries scientists are having in predicting stock changes have been widely noted both in academic circles and within the bureaucracy itself. William Fox, Director of Science and Technology for the National Marine Fisheries Service, said in speaking of fisheries science, "It's not really science; its like an artist doing it-so a large part of your scientific advice comes from art" (Appell2001: 19). Nevertheless, most fisheries scientists have assumed that the basic precepts of population dynamics are correct, and that our ability to predict

changes in stock can be greatly enhanced by improving fisheries models and gathering better information to put in them.

Increasing numbers of people experienced in fisheries management are beginning to suspect stock-recruitment models are fundamentally flawed and they cannot be cured by fine tuning the models and gathering more data. In this regard Berkes and Folke (1998: 2) state that "...resource management is necessary, but that it required a fundamentally different approaches, not mere tinkering with current models and practices." We may never be able to predict changes in fish stocks or the outcomes of management options. The problems are so basic that we may need a whole new approach to management.

The critics of standard scientific management say that the basic problem is that fisheries science is built on a inaccurate view of the ocean. Fisheries science assumes that oceans are relatively simple linear systems which tend toward equilibrium. In reality, oceans are very complex, and very likely are chaotic systems. Hastings and Higgins argue that fish population are chaotic (1994). This conclusion is buttressed by the work of our research group at the University of Maine, which showed, using a simulation model, that even simple communities of fish vary unpredictably with limits, even though it is bounded within a range (Acheson and Wilson 1996; Wilson et al. 1991a, 1991b). However, there is no consensus on the matter, and none is like to emerge for some time.

Even if fisheries are not chaotic they are certainly complex and therefore highly unpredictable (Ludwig, Hilborn and Walters 1993). In either case, accurate prediction would be very difficult or impossible. Two factors make it very difficult to predict changes in stocks or the effects of a management policy. First, although there are regularities in such complex systems,

such a large number of relationships is involved in such systems and the feedback mechanism in the system are so complicated, that a huge amount of accurate, fine-grained, continuously updated data would be necessary to make accurate prediction possible. Second, models of complex systems contain variables which are very sensitive. This means that small variations or inaccuracies in measurement would result in great errors in prediction. Under these conditions, accurate prediction is a practical impossibility.

If this is correct, then fisheries management is bound to be a highly uncertain enterprise. This poses tremendous problems for policy makers because under conditions of uncertainty, many different interpretations can plausibly be made of the same data, a number of policies can be supported, and controversy is inevitable. In this regard, Jasanoff(1998: 154) says, "For in complex systems under study, enough suggestive and even persuasive evidence can be found to sustain very different overall stories about what is really going on. Lacking ways of testing or falsification, neither theoretical position is able to deal a body blow to the other. Ideology and politics thus become the primary determinants of choosing among competing scientific accounts of felt reality." In lobster management, scientific uncertainty has certainly given rise to a good deal of political controversy.

If fisheries are complex, and possibly chaotic, then the key questions for fisheries managers are: How do we manage under conditions of extreme uncertainty? What can be done to conserve stocks when we really do not know what affects stock sizes and cannot predict the effects of policies?

Hollings (1978) and Walters (1986) have suggested that fisheries be managed by what they term "adaptive management". Adaptive management is predicated on the idea that

ecosystems are not only complex, but that they are marked by a number of feedback mechanisms and irreversible processes. Under these conditions, interactions between people and ecosystems cannot be predicted and results in a number of "surprises". As a result, resource managers should treat policies as experiments from which they can learn. Management from this point of view is a kind of iterative process in which policies are enacted, their effect observed, and the policies changed repeatedly to get better results. But policies can never be matched perfectly to ecological conditions because those conditions change-sometimes rapidly and in ways that are impossible to predict. Thus the process of developing effective policies is continual.

While the work of Hollings and Walters has been very inspirational, it leaves two essential questions unanswered: 1). How should resources be managed? 2). How do humans learn about their environment and how to manage it effectively.

We have attempted to answer the first question by advocating parametric management. That is, that regulations would be framed to maintain critical life processes. In the case of fisheries, these rules would they would maintain habitats necessary for the well being of these species (i.e., spawning grounds, breeding grounds, nursery areas, migration routes, etc.). This can be done by rules limiting how fishing is done. It is exactly these kinds of rules that are found in so many fishing societies around the globe

As previously noted, lobster conservation rules are framed to preserve lobsters in crucial parts of their life cycle. They are designed to preserve the reproductive stock and the proven breeding stock (the V-notch and oversize laws), and the juveniles (i.e., escape vent and the minimum size law). There is no quota on lobster at all.

Moreover, the same kinds of management rules are found in many tribal and peasant societies in the world. As in the lobster industry, these rules limit how fishing is done by specifying where fishing will be done, the techniques that will be used and the times when fishing shall be allowed (Acheson and Wilson 1996; Wilson et. al. 1994). The fact that such rules are used so widely suggests that fishing peoples in a wide variety of societies have hit on some kind of universal principle that appears to be effective in conserving fish stocks.

These kinds of rules are used so widely, we argue, because they are consistent with the chaotic nature of fisheries. In simulating fisheries under conditions that approximated real life conditions, it became apparent that the outputs of the models vary unpredictably, but they varied within certain ranges. These ranges are set by the parameters of the model, which were assumed to be constant. In the model, these parameters were stable biological processes such as growth potential, migration, growth rates, and habitat. The fact that the populations of fish vary within specifiable limits when these parameters were held constant suggests that fisheries can be managed by maintaining these parameters..

How people learn about the environment is even more problematic. This is a crucial issue if we want to understand solutions to communal action dilemmas. Afterall, fishermen are devising rules to conserve stocks with their own economic interests in mind. They do not want to develop rules that are costly, and ineffective. But how do they know what is effective in conserving the stocks? When do they make mistakes and advocate the wrong policies?

In recent years, a number of social scientists and cultural ecologists interested in resource management have assumed that one source of accurate knowledge about the environment is traditional folk knowledge (Johannes 1981). Such knowledge has lasted a long time because it

has survival value. Hunn, for example says that traditional ecological knowledge "bears more than a fanciful resemblance to the genome of a species. That genome is a blueprint for a way of life that has survived." (Hunn 1999:26). As a result, it is asserted, scientists should pay attention to what resource users know. In this regard, Gisli Palsson has written "If Marine ecosystems are chaotic and fluctuating regimes, those who are directly involved in resource use are likely to have the most reliable information as to what goes on in the system at any particular point in time. Often, however, scientists are reluctant to collaborate with fishers." (Palsson 1995: 92). That theme has been echoed in the work of Feit (1973, 1987), and Berkes (1995).

There can be little doubt that much folk knowledge is highly adaptive, and should certainly be taken into account when management decisions are undertaken. But it may be all too easy to over emphasize the utility of local level knowledge. Afterall, much of what resource users need to know is how to locate concentrations of animals in the short run; management involves knowing how to sustain species in the long run. These are two different problems and they involve two different kinds of knowledge. We need to ask to what extent we can rely on traditional knowledge or local level knowledge to be a guide for management. Berkes and Folke (1998: 13-14) point out that "Ancient cultures and indigenous peoples often have a longer-term relationship with their environment than do others, but they certainly do not have monopoly over local ecological wisdom." They go on to quote Anderson's observation that "folk beliefs are a melange of truth and inaccuracy. (Anderson 1996: 101). "It is a major task, therefore to seek out ecologically sensible practices and knowledge from the mixture of superstition, beliefs and folk-science." The problem is that humans are capable of learning a great deal about their environment and can manage it well. They can also misunderstand their environment and make

serious errors in managing it.

John Bennett identifies the source of these errors as difficulties in understanding feedback in socio-ecological system. He writes "when information content of feedback messages is detailed and relevant to the issue, decisions are likely to be "rational"-that is, appropriate to the ends sought or the consequences visualized. When information content is limited, or erroneous, the resultant decisions are likely to be "irrational" or randomly related to the desired states. In such cases, fantasy, symbolic elements or emotional factors are likely to dominate (not, of course, that they are every entirely absent in any case)." (1976: 253). Wilson has elaborated on this observation to point out that these errors stem, in the main, from the fact that feed back in these complex system is often ambiguous and that people with inadequate or poor models focus attention on irrelevant aspects of the system. Another source of error is that the effect escapes the system (Wilson 2001).

The Maine Lobster industry provides examples of both incredible insight and serious errors in understanding the environment, and ways to manage it.. Members of this industry have come to some correct conclusions about what should be done to manage the resources-in some cases before the scientists. They have insisted that the V-notch and the oversize measure were effective in conserving the lobster for several decades. Only in 2000 have Federal and State biologists have come around to this point of view and not all of them are convinced yet. However, in other cases, large numbers of lobster fishermen have made claims which are not supported by the facts. Many members of the industry are convinced that the "bust" was caused by the "poverty gauge" and the lack of bait in the water (i.e. the culturing hypothesis). These ideas are almost certainly wrong. This underlines of problems people have acquiring accurate

information about a very complex environment.

It is still not clear to me how the lobster industry happened to hit on the idea that the V-notch and oversize measures were effective. These rules are designed to protect breeding females and the reproductive stock. Many cultures have resource management systems based on similar rules, including the Rock Cree. Brightman 1993: 303-323) who has studied the Rock Cree ideas about conservation comes to no certain conclusion about the genesis of these management ideas.

Social scientists have made a number of observations and claims about how people learn environmental knowledge. Palsson (1995) argues that Icelandic fishermen learn in a practical arena by doing tasks at sea while working as part of a crew. His description has been influenced by the work of Lave and others (1993) who argue that much knowledge and craftsmanship is "situated learning" obtained by democratic exchanges with fellow workers in on the job training. This is a very different view of learning than the one offered by standard learning theory. Wilson (2001), by way of contrast, argues that people exploiting complex environments can learn about them by 'recognizing patterns.' If this will not give them the capacity to predict catches and stock sizes, it will allow them to understand enough about these systems to develop effective management plans.

Ostrom, among others, has noted that the organization of the resource user groups themselves can have a marked effect on their ability to learn about the environment. In this regard, she says, "redundancy" is very important (Ostrom 1999a: 526). Having several units experimenting with rules simultaneously reduces the opportunity for resource failure over a wide area. Redundancy also provides more opportunities to learn than is the case if only one

experiment is occurring. In this regard, the organization of the lobster industry provides good opportunities to learn. Each of the seven lobster management zones is carrying on an experiment; and a good many of the harbor gangs have their own local rules, which provide another source of information about the effect of management rules (e.g chapter 3).

While these points give some useful information about the problem of how we acquire information about the environment, there has been no definitive study of the problem to date.

How we acquire accurate or inaccurate information about the environment is a crucial issue if we are to understand how effective institutions are developed to conserve resources. We need to know much more about this process.

Organizational Problems: Top Down Management vs Co-management

The structure of many governments is going to present a huge obstacle to establishing co-management or bottom-up management. This is true even in the United States where our federalist tradition makes us far more sympathetic toward local control than in many other countries in the world. If co-management is going to succeed, governments must be willing to share power with groups of resource users, and government officials must be constrained from dictating to local groups. If the United States were operating as the framers of the Constitution envisioned, this might be more easily accomplished.. Essentially, the founding fathers conceived the United States to be a federal system with characteristics of what Vincent Ostrom calls a polycentric system. That is it is a system that has "many centers of decision making that were formally independent of each other" (V. Ostrom 1999: 52). "The essential defining characteristic for a polycentric political system is one where many officials and decision structure are assigned limited and relatively autonomous prerogatives to determine, enforce and alter legal

relationships. No one office or decision structure has ultimate monopoly over legitimate use of force in a polycentric political system" (1999: 55). In such systems, units of government perform different functions and can maintain their independence from other branches of government because each unit has "veto capabilities in relation to other decision structures" (1999: 64) that are guaranteed by constitutional level rules. In a polycentric system, where power is traditionally shared, it would presumably be possible for groups to assume control over a resource or share managerial control with a government unit. By definition, co-management would be virtually impossible in monocentric systems where all power to determine and enforce laws is centered in one dominant government unit.

In the United States, the Constitution establishes a polycentric system in which a few powers are given to the central government and the rest automatically are the prerogative of the States. However, in the past 80 years the United States has moved away from this polycentric model. Before the Roosevelt administration, the government was largely a bottom-up operation in which the states and large cities had the most weight. After that time, the Federal government came to dominate and exert control over vast areas of life.

The Federal government now provides a huge number of services affecting every aspect of life ranging from health care (Medicare and Medicaid), retirement funding (social security) and education (both elementary and higher education) to environmental protection, agriculture, transportation, and community development. At the same time, the Congress has passed innumerable laws giving the Federal government power to regulate an enormous number of activities and products (e.g., workplace safety, automobiles, food products, consumer advertising, rules to prevent discrimination, to mention just a few). All of these services and regulations are

in addition to those that have long been the traditional functions of the Federal government such as defense, post office, and foreign policy.

The agencies developed to provide services in all of these areas did not supplant lower levels of government. Rather, they work through them to provide services and funds to the ultimate recipients. State and local governments expanded greatly to handle these additional demands on them. In the process, they lost a lot of autonomy, and many local and state agencies became cogs in a system dominated by the central government.

Over the course of time, the Federal government has developed a number of mechanisms to influence and control the activities of these lower level governmental units. They give funds and tax incentives to encourage desirable behavior. They have also developed sanctions to punish lower level governmental units that do not behave in accordance with federal law, including withholding of funds (Bickers and Williams 2001: 156-153).

In short, top down management by agencies of the Federal government is now our standard way of governing the country. It should come as no surprise to us that the laws passed by Congress to manage fisheries (i.e., the Fisheries Conservation and Management Act and the Sustainable Fisheries Act) as well as laws designed to protect various marine species (i.e., the Endangered Species Act and Marine Mammal Act) have given Federal agencies a good deal of authority to manage in a top down fashion.

In summary, co-management or bottom-up governance structures appear to be more effective than top down management structure in managing fisheries. If we are going to develop co-management, we need to evolve polycentric systems, which are amenable to bottom-up, power sharing arrangements. For the past 80 years, however, we have been moving in exactly

the opposite direction, towards top down management. It would take a major change in the laws to reverse direction.

Progress towards reasserting local control could be made if the FCMA and Sustainable Fisheries Act were amended to remove the ability of the Secretary of Commerce to preempt the powers of the states, and the Atlantic Coastal Fisheries Cooperative Management Act were changed to remove the ability of the Secretary of Commerce to declare a state "out of compliance" and end all fishing for affected species in state waters. The independence of the Regional Councils could be bolstered by a change in the FCMA allowing plans passed by the Council to be enacted into regulation without oversight by the NMFS and Secretary of Commerce. Another move to reestablish polycentric government would be to give local and state governments more power to negotiate management of species falling under the Marine Mammal Act and the Endangered Species Act and more power to contest judgements of the federal courts. Such changes would severely restrict the power of the Federal agencies and courts to regulate fisheries, and consequently would not likely be considered. We can predict that proposals to make such changes would be massively opposed. This is a testament to how far down to road to monocentric control we have gone.

These scientific and organizational problems do not body well for the management of fisheries. To manage fisheries we need to know what controls stock sizes; be able to identify management strategies and mechanisms that (singly or together) have a favorable effect on stock sizes and prevent stock failure; and we need to be able to get the political support necessary to develop the organizations and rules to sustain those stocks. To date the federal fisheries agencies have had major problems accomplishing any of these tasks.

The lobster industry succeeded, in part, because it has been able to circumvent many of the problems inherent in the federal management system. The industry has stubbornly insisted on developing and maintaining sets of rules they are certain are effective, even though those rules have been opposed by the majority of lobster scientists working for government agencies. They have often been aided in this endeavor by officers of the Maine Department of Marine Resources and by members of the legislature. Their case has been strengthened by record high stock sizes and catches, which has made it difficult, to define the lobster fishery as "overfished" even though some federal and state scientists would have loved to do so. History has also played an important role. Most of the state lobster conservation laws were in place before the Federal Government played any role in management.

Resource Management and Public Goods

Many of the problems of the management agencies stem from the fact that they are producing public goods, and the production of public goods has certain built in problems. Public goods again, have two characteristics: once they are produced, it is difficult to exclude people from using them; and they are non-sub tractable so that one person's enjoyment of them does not detract from another's use of these goods (Osrom, Gardinar, Walker 1994: 7). This means that public goods are very difficult to provide by the market since there is little sense in investing in a good that every one can enjoy-even those people who have not contributed to providing the good. Where public goods are concerned the incentive to free ride is irresistible. Thus if public goods are to be provided, there must be some means of forcing users to pay their fair share of the costs of producing and maintaining such goods. For this reason, most public goods are produced by the government (Ostrom and Ostrom 1999).

There are three kinds of problem inherent in the production of public goods which affect resource management in general and which have occurred in lobster management to one degree or another. First, enforcement is always a problem. It is difficult to get those using public goods to pay for their provision. It is certainly difficult to get fishermen to obey management rules and contribute financial support to management agencies, than it is to get the users of private goods to pay for them. Second, most public goods are "co-produced" meaning that cooperation of the provider of the service and the user of those services is necessary to ensure quality. Teachers alone cannot provide a quality education without the cooperation and efforts of students. The quality of public health necessitates effort on the part of both officials and the public (Ostrom and Ostrom 1999). In a similar fashion, the effectiveness of fisheries management efforts will depend on efforts of fisheries management agency personal as well as the fishermen. In most cases, it is difficult to get the support of fishermen due to the communal action problem inherent in fisheries management. Third, it is difficult to "monitor the performance of public employees" since there is no easy way to measure the amount or quality of the output and hence, there is no way to measure the output of the public goods themselves (Ostrom and Ostrom 1999: 81). In this regard, fishermen and legislators have increasingly suspected that the quality of fisheries science is deficient, but absolute proof was certainly lacking. Last, since it is difficult to measure the output of public goods, there is no adequate selection mechanism for either institutions or policies.

The problems of organizations producing public goods are put in still another perspective when we consider the characteristics of organizations producing private goods. In the modern world, most private goods are produced by firms. The literature on transaction cost economics points out that firms

producing private goods have several mechanisms which help them maintain the quality of their products and efficient organizational forms. First, obtain income by selling the goods and services they produce to consumers or other firms in the production chain. Information on sales and costs provides an immediate means of assessing their performance. Second, they can use competitive markets to get the goods and services they need or they can expand their own firm to produce them. Their choice is dictated by economizing on transaction costs.. (Williamson 1975: 102-105; Williamson 1985: Chaps 4-6; 1986b: 85-99). Last, they have a way of measuring the worth of alternative policies and organizational in the form of the monetary costs and revenues produced by various alternatives. They have a standard of selection in terms of profit. Organizations producing public goods cannot sell their products in competitive markets, which denies them an important source of information on their productivity and efficiency. It also denies them one of the primary adaptive options enjoyed by firms—namely the ability to use markets if in house production proves too costly. It removes the standard by which firms judge their employees, alternate policies or organizational options. They have not been able to devise a substitute.

Management of the Maine lobster industry has been successful where it has been able to solve some of these problems; and it's problems stem from the fact that it has not been able to solve others. The nature of the harbor gangs and the strong conservation ethic have allowed this industry and the state officials to solve the enforcement problems in the main. The generation of state laws, especially the zone co-management system provide a good example of co production of a public good and the variables promoting such co-production. Federal management of the lobster industry, by and large, is a case study of the factors inhibiting the co-production of a public good. The most serious problems facing lobster management stem from the fact that no adequate mechanism has been devised to select out good policies and institutions. The ASMFC has recently come to see the value of the V-notch and the oversize, but only on the heels of 25 years of political stalemate caused by the Regional Council/NMFS governance

structure. The most hopeful governance structure permitting co-production of rules for the fishing industry is some form of co-management. We have begun to move toward co-management of the lobster industry at the State level and through the ASMFC, but overall State and federal policy clearly favors top down governance structures. These efforts have been largely successful. There is much that can be learned about the provision of public goods from a study of the management of the Maine lobster industry.

Many clues about ways to improve resource management in general could be had by viewing the problem in a public goods perspective. A lot of our problems with the management of resources lies not in villainy and incompetence, but in the nature of public goods themselves. Most public goods can only be provided by the government. This is certainly true of the rules to manage resources over large areas. If we are going to improve resource conservation we are going to have to learn a lot more than we know now about the nature of government failure and the provision of public goods in general. The key question is how do we get groups of people to devise enforceable rules to constrain their own exploitive effort for mutual benefit? What kinds of organizations allow local level groups to solve these kinds of communal action problems?

Final 6/26/01

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