Fisheries Law Enforcement: Programs, Problems and Evaluation

Proceedings of a Workshop on Fisheries Law Enforcement, The University of Rhode Island, October 21-23, 1985

Editors:
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TABLE OF CONTENTS

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JGS & TMH

PREFACE

Enforcement of fisheries law obviously is a critical element of fisheries management, for without proper enforcement, compliance with regulations is inadequate and management ineffective. Enforcement also is one of the most costly components of federal fisheries management in the United States. In 1985, nearly 60 percent of all expenditures to carry out the Magnuson Fishery Conservation and Management Act were for enforcement. The high costs and problems associated with implementing enforcement seriously complicate management programs. In some fisheries no management plans have been implemented because of the high costs of enforcement. In other fisheries the problem persists of devising regulations that are biologically suitable, politically feasible and enforceable. Clearly, improved regulatory and enforcement strategies are needed which are less costly and at the same time sufficiently effective to achieve management objectives.

The workshop in fisheries law enforcement was designed (i) to identify principal problems and policy issues regarding the administration and implementation of fisheries law enforcement, and (ii) to define these problems and issues in researchable terms. Workshop participants were from government, industry and academia in the United States, Canada and Denmark. Their papers represent significant contributions toward defining the many dimensions of the enforcement problem and some approaches for its study.

FISHERIES LAW ENFORCEMENT IN THE UNITED STATES

by

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Enforcement of fisheries law has been a practical concern at least since the fifteenth century when Scotland claimed exclusive rights to fishing within fourteen miles of its shores (Clarkson 1974). In the United States, several federal laws have for decades required enforcement, e.g., the Northern Pacific Halibut Act of 1937 and the Sockeye Fishery Act of 1947. With the passage of the Magnuson Fishery Conservation and Management Act (MFCMA) of 1976 annual federal expenditures on fisheries law enforcement more than doubled and in 1977 exceeded $100 million.

The strain on limited enforcement resources brought on by the Magnuson Fishery Conservation and Management Act (MFCMA) has stimulated attempts to explicitly consider enforcement aspects when promulgating regulations. Indeed, Executive Order 12911 requires that the costs of enforcement be included in the regulatory impact analysis contained in fishery management plans. Regulations that have proven unenforceable have been modified, as called for in the national standards guidelines of the MFCMA. And, recently, regulations that can be enforced dockside are gaining favor over those requiring more costly at-sea enforcement.

The purpose of this paper is to argue for the importance of enforcement to fisheries management in the U.S. The federal fisheries law enforcement program is described, and we consider fishery regulations, observer coverage, Coast Guard air and sea patrols and boardings in the fishery conservation zone. Then a preliminary evaluation of the federal enforcement program is presented. We discuss the data on and problems associated with compliance measures and the types and incidence of detected violations for foreign and domestic fishing vessels. This is followed by an analysis of the trends and patterns of expenditures on

federal fisheries law enforcement. In addition to recent expenditures, we consider projections of future enforcement needs and expenditures, and present our conclusions.

Fishing Regulations under the MFCMA

Under the MFCMA, regulations specified in management plans may include:

1) limitations on the catch of fish, based on area, species, size, number, weight, sex, incidental catch, total biomass, or otehr factors;
2) designated zones where and periods when fishing is limited or permitted only by specified types of vessels or gear;
3) prohibitions, or other controls, on specified types and quantities of fishing gear, fishing vessels or equipment for fishing vessels;
4) a system of limiting access to a fishery.

These four possible sets of regulations can apply to both foreign and domestic fishing vessels. Foreign fishing vessels are required by the MFCMA to:

5) obtain a permit from the U.S. government and prominently display the permit in the wheelhouse of the vessel;
6) pay designated fees in advance;
7) permit U.S. observers to be stationed aboard the vessel, and incur the full cost of such;
8) provide specified data on their fishing activities, which may include data on catch by species, type and quantity of gear used, areas fished, time of fishing and number of hauls;
9) reimburse U.S. citizens for any loss of or damage to their vessel, gear or catch caused by the foreign fishing vessel.

Of course, the foreign fishing vessels of one nation are prohibited from harvesting, in any year, an amount of fish which exceeds that nation's allocation for that year.

Of the above regulations, catch limitations are the most prevalent, followed by time-area closures and gear restrictions. Catch limitations most commonly take the form of an aggregate annual quota for specified species and areas. When the recorded catch for the year equals or exceeds the quota, the fishery is closed. Other common catch limitations include restrictions on incidental catches (i.e., of nontargeted species) on both a trip and aggregate basis. Restrictions on the size of fish landed are used in a few fisheries.

Time-area closures (i.e., designated zones where and periods when fishing is prohibited) have been used in most fisheries subject to management plans. It is common to combine this form of regulation with others -- e.g., catch limitations and gear restrictions.

Gear restrictions appear to be slightly less common than time-area closures. The regulation usually specifies the type of gear allowed in the fishery. In trawl fisheries, for example, the mesh size of the cod end must not be less than a specified length when measured a certain way; and only barbless hooks may be used to catch salmon off the West Coast.

Restricting access to a fishery is not common, though some forms of the regulation are found in FMPs for Alaska high-seas salmon, Washington, Oregon and California commercial and recreational salmon, and Atlantic surf clams and ocean quahogs.

Management plans typically employ multiple regulations. For example, the FMP for the relatively simple northern anchovy fishery uses three types of regulations: aggregate annual catch quotas, time-area closures,

and restrictions on the minimum size of the fish landed. FMPs for more complex fisheries, such as groundfish and salmon, use a greater array of regulations.

Enforcement of the law and regulations under the MFCMA is the joint responsibility of the Coast Guard (Department of Transporation) and the National Marine Fisheries Service (Department of Commerce). Fisheries law enforcement activities of the Coast Guard traditionally have been limited to surveillance and inspections of offshore fishing operations. NMFS personnel frequently accompany Coast Guard fishery patrols, making the offshore enforcement activity a joint endeavor. Onshore, or dockside, enforcement of the MFCMA has been the traditional responsibility of NMFS in conjunction with state enforcement agencies.

Principal Enforcement Modes

Offshore enforcement comprises three principal modes: observers, sea patrols, and air patrols. The observer program operated by NMFS places an individual on board a foreign vessel to monitor its fishing activities. While observers have no authority to take enforcement actions, they fulfill an important role in the enforcement process. Besides monitoring and recording the foreign vessel's activities, they can summon enforcement personnel if a violation is suspected. Table 1 shows the extent of observer coverage of foreign fishing. Coverage for the entire FCZ has increased from less than 20 percent to nearly 50 percent in 1983; and in the important Alaska region coverage has increased from a low 10 percent in 1980-81 to nearly 45 percent in 1983. Observer coverage also increased substantially in the Northeast and Northwest regions, during 1982-83.

Table 1

Table 1. Observer Coverage of Foreign Fishing

Region	Days of foreign fishing with observers on board[a] 1979	1980	1981	1982	1983
Alaska	6,683 (15.1)	4,696 (10.0)	4,249 (10.0)	11,952 (29.8)	17,775 (44.9)
Northwest	1,387 (37.0)	971 (40.6)	1,064 (29.2)	1,496 (77.6)	1,287 (86.1)
Southwest	27 (100.0)	43 (100.0)	45 (100.0)	82 (100.0)	20 (100.0)
Southeast	558 (21.1)	613 (20.8)	1,309 (20.9)	0	0
Northeast	1,587 (23.2)	2,024 (26.6)	1,525 (19.0)	2,956 (34.4)	2,739 (57.9)
Total	10,239 (17.8)	8,347 (13.9)	8,192 (13.5)	16.486 (32.5)	21,821 (47.3)

[a]Percent coverage of foreign fishing in parentheses.

Source: Peterson (1982), National Marine Fisheries Service as of (7/84).

Sea patrols by Coast Guard ships and boats is the most comprehensive enforcement mode. Ship and boat patrols can both detect and apprehend violators and can be conducted in all weather where fishing takes place. Large ships can remain on scene in a location far from port for long periods, while smaller boats present a less obvious enforcement presence. Boardings at sea from such patrol ships and boats provides detailed information on catch, gear, processing, and data reporting requirements. Boardings cannot monitor the fishing operations as completely as an on-board observer, who can conduct nearly continuous monitoring. Surface patrols and boardings alone may be capable of providing a high level of enforcement. However, it is clear that on-board observers and air patrols significantly enhance the effectiveness of surface patrols in the fisheries law enforcement program.

Air patrols are typically used to search large areas to determine the number, type, and identity of fishing vessels. As provided by the Coast Guard, air patrols range from large, long-distance, fixed-wing craft, such as the C130, to helicopters flying short-distance sorties off the decks of cutters. Air patrols can detect limited types of regulatory violations. Violations of a closed area regulation can be readily detected by air patrol surveillance, however, violations of catch limitations and gear restrictions are usually impossible to detect from the air. Of course, air patrols cannot directly apprehend suspected violators. Surface vessels must be called in to board the vessel and issue the citation. Air patrols also are often limited by weather conditions. In sum, while air patrols can monitor fishing vessels in large areas, they are an important complement to other enforcement modes and cannot be expected alone to achieve enforcement goals.

Onshore, or dockside, enforcement modes include monitoring landings, inspecting primary buyers (dealers/processors), and general investigation (NMFS 1982b). Dockside monitoring of a vessel's landings for species, sizes, and quantities is easier and, therefore, can be more complete than at sea. Dockside monitoring cannot reliably determine where fish were caught nor the gear actually used. Since most foreign vessels do not normally land their catch in domestic ports, dockside monitoring requires bringing the vessel to port, a time consuming and expensive process. Inspecting primary buyers of fish can be effective for detecting violations of minimum size and prohibited species regulations. Typically there are relatively few primary buyers, making this mode a low-cost means of monitoring landings. Of course, this mode is incapable of detecting violations or gear restrictions, closed areas, and individual trip or vessel quotas. According to the enforcement guidelines (NMFS 1982b), investigation includes undercover operations, radio monitoring, data analysis, use of informants and casual conversation with fishermen and primary buyers. This investigation mode is often used to detect organized and repetitive violations, and can provide information on compliance and effectiveness of an enforcement program. At the time of this research report, no data were available on the extent of dockside enforcement activities.

Evaluating Enforcement: Some Preliminary Results

The law and administrative process recognizes that efficient enforcement is an essential element in sound fishery management. NMF's draft guidelines on enforcement note that Executive Order 12291 requires that enforcement cost considerations be included in the regulatory impact

analysis contained in fishery management plans. The discussion of national standards guidelines (NMFS 1982b) specifically states:

> The (management) measures should allow for practical and effective implementation and enforcement of the management regime, so that harvest is allowed to reach, but not to exceed OY (optimum yield) by a substantial amount. The Secretary then has the obligation to implement and enforce the FMP so that OY is achieved. If Management measures prove unenforceable -- or too restrictive or not rigorous enough to realize OY -- they should be modified . . . (Emphasis added.)

The discussion of national standard 5 - Efficiency - states:

> Management measures should not impose unnecessary burdens on the economy, on individuals, on private or public organizations, or on Federal, State, or local governments. Factors such as fuel costs, enforcement costs, or the burdens of collecting data may well suggest a preferred alternative. (Emphasis added.)

In addition, the FCMA Operations Handbook advises Regional Fishery Management Councils on:

a) enforcement modes available to meet the requirements of regulatory regimes;

b) the relative costs and effectiveness of the enforcement modes; and

c) the factors influencing amounts of enforcement necessary to achieve a reasonable level of compliance.

Compliance objectives and the enforcement factors which are directed to these ends are major considerations in deciding on alternative fishery management measures. The importance of this particular feature of the task environment was underscored by William Gordon, Director of NMFS, in a memo to his regional directors:

"To implement additional fishery management plans without additional resources, we must improve efficiency in obtaining compliance and/or simplify the enforcement requirements" and "additional strategies and management options need to be developed to reduce enforcement costs without undue loss of management effectiveness." (Gordon 1983)

Given these expressed concerns with enforcement efficiency, a systematic assessment of the costs and benefits of the enforcement program would be in order. Unfortunately, the lack of adequate data precludes measuring the economic costs and benefits of enforcement. Therefore, we choose to focus on less preferred indicators of performance: compliance and expenditures.

Compliance

Compliance with regulations is, of course, necessary if benfits from fisheries management are to be realized. Therefore, the extent of compliance is often viewed as a meaningful measure or indicator of enforcement performance.

We view compliance as fundamentally a problem of choice for individuals subject to regulation. We assume that subjects facing such constraints have preferences concerning alternative states of the world and are capable of choosing among these.[1] In this sense, compliance mechanisms structure the incentives of fishermen as they go about deciding whether to comply with the regulation or not. In an attempt to obtain such compliance, government officials invest in a variety of compliance mechanisms. In doing so they should ask: "What mix of mechanisms will prove optimal in dealing with the set of compliance problems considered likely to arise in the future?" (Young 1979:6). We see individuals making choices among these available alternatives. In making such choices, individuals will act to maximize their own welfare. That is, they will act in terms of the expected value of alternatives in the realm of compliance (Young 1979:17; Rapaport 1976). In this context, those being regulated will use subjective probabilities to calculate expected outcomes.

Regulations attempt, through the regulatory process, to influence the private benefit-cost calculations of the regulated individuals in order to obtain acceptable compliance levels. But questions remain concerning which factors individuals will take into account in making such choices. There are a variety of such factors, but Becker (1968) identifies the following: 1) the probability of violating without being detected; 2) the benefits associated with such undetected activities; 3) the probability of being detected, but avoiding sanctions; 4) the benefits associated with 3; and 5) the probability of being detected and sanctioned and the costs of such sanctions. In making these probability calculations, the individual is assumed to compare the expected value of returns from violations with the expected value associated with compliance. Andersen and Sutinen (1983) employ Becker's paradigm in their formal model of fisheries law enforcement.

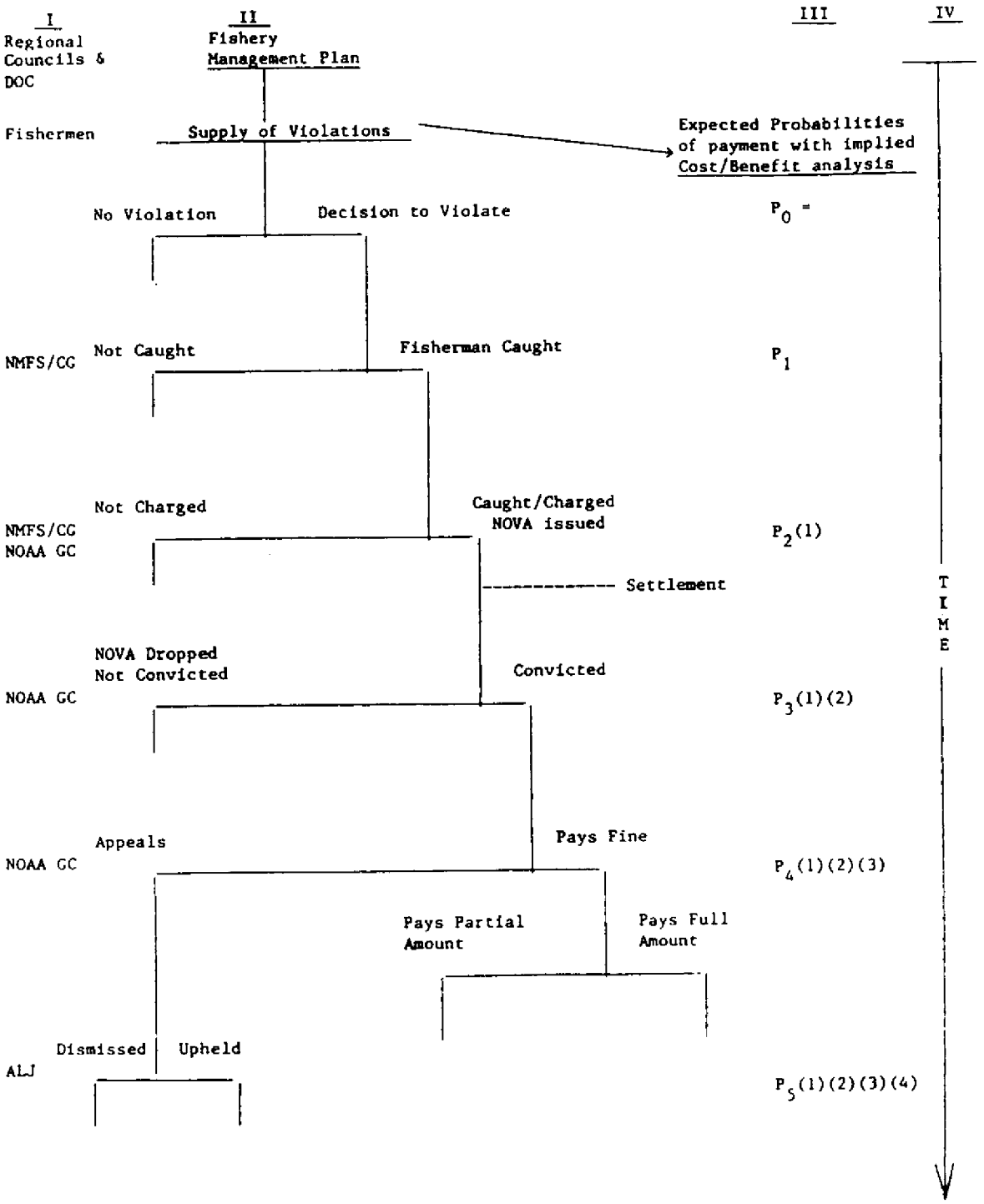
There are at least two problems with using compliance measures as performance indicators. First, as shown by Andersen and Sutinen, a high level of compliance is not necessarily desired for a cost-effective enforcement program. Second, the extent of overall compliance is nearly impossible to measure and, therefore, is not known. The available data merely measure the extent of detected noncompliance. That is, while the number of documented infractions is known, they are in fact only a subset of total noncompliance. If surveillance and monitoring were random, in some appropriate way, the levels of detected noncompliance could be extrapolated to the entire population to provide an estimate of the overall levels of noncompliance and compliance. Monitoring and surveillance -- especially boardings and inspections -- are not random, however. The typical enforcement program rationally focuses its surveillance and monitoring efforts on those vessels which most likely are

not complying with regulations. (Such expectations may, for example, be based on a vessel's past behavior.) Other things equal, this concentration of surveillance and monitoring effort biases upwards the estimate of overall noncompliance.[2] The bias cannot be taken into account since the extent of concentration is not known and surely varies across fisheries and over time. A factor which may bias downwards such an estimate of noncompliance is the preponderance of evidence rule. In civil law infraction or offense is deemed provable when there is a preponderance of evidence in the government's favor. Preponderance of evidence is operationalized as being 51 or more percent of the evidence is likely required to be in the government's favor.[3] The rule of evidence may result in fewer infractions being reported officially than are actually known. In sum, due to biases inherent in enforcement procedures and practices, the extent of detected noncompliance cannot be used to estimate the extent of overall noncompliance and compliance.

Stigler (1970) argues that public authorities have four basic means to improve compliance: 1) minimize the chances that violations will go undetected; 2) maximize the probability that sanctions will follow the detection of violations; 3) speed up the process from time of detection to assignment of sanction; and 4) make the sanctions large. There is dispute among experts concerning the best alternative or mix of alternatives among the above four. Some scholars have argued that the probability of being sanctioned is more important than the size or magnitude of the sanction (Becker 1968; Tullock 1974), while others have argued that making the charging time follow as closely as possible to the detection of illegal behavior is the most important factor in enhancing compliance. A diagram of the overall enforcement process is presented in Figure 1 which follows. (Hennessey & Kaiser, 1986:3)

Figure 1

U.S. Fishery Management Enforcement System



Supply of Detected Violations

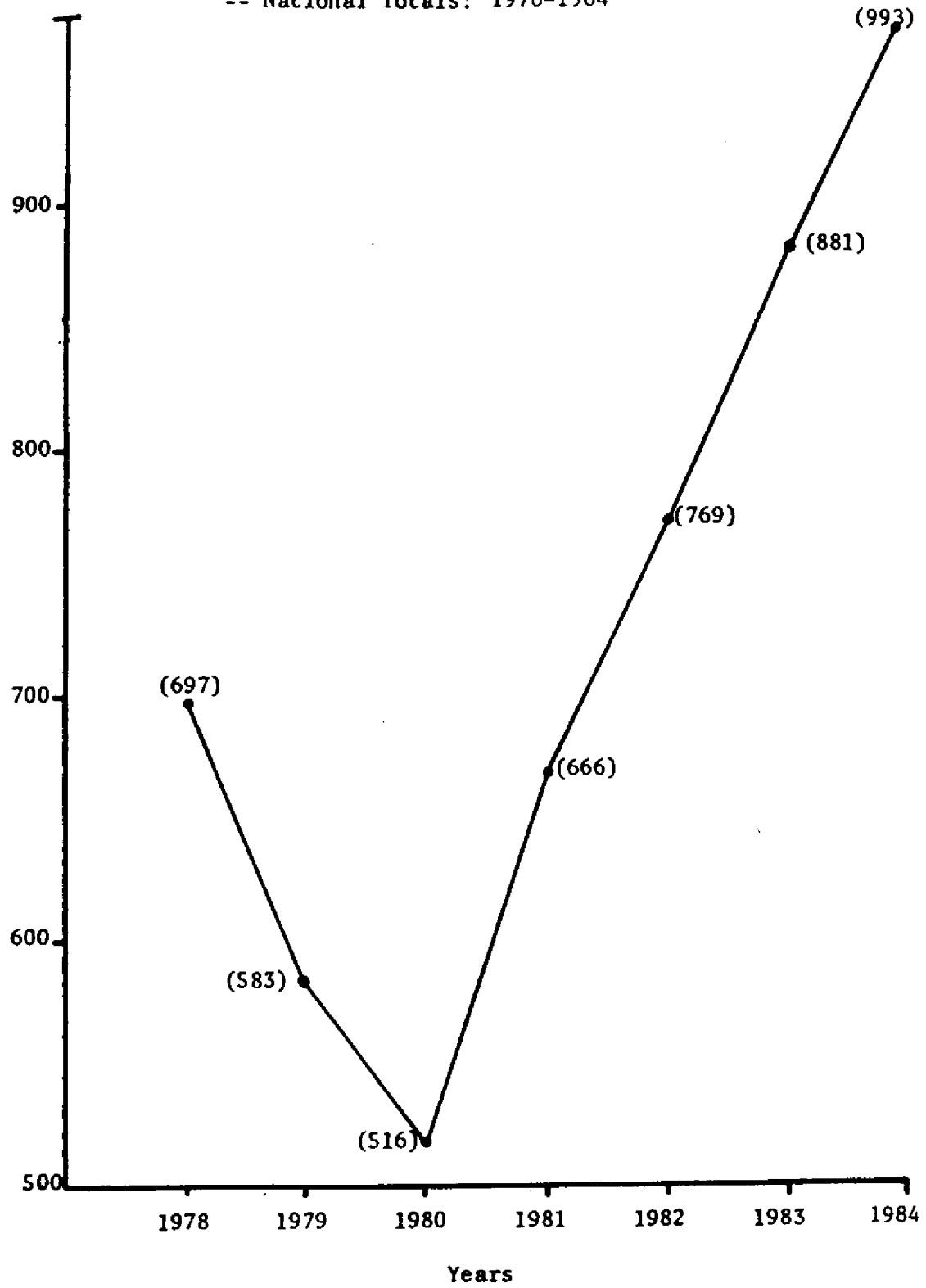
No data are available on the first two of Stigler's means; however, the following evidence is available on the third and fourth means of influencing compliance. There are four principal types of enforcement sanctions: citations, violations, seizures and permit sanctions. A citation is a written warning involving no penalty, usually issued for a technical infraction or an infraction of minor consequence. A violation is a civil penalty, issued for serious infractions and carries a maximum fine of $25,000 per day of violation. A Seizure of a fishing vessel is reserved for gross, flagrant infractions of conservation or criminal law and carries a maximum penalty of $100,000 fine and/or 10 years imprisonment plus forfeiture of the vessel, gear and catch. A permit sanction revokes or susupends an individual's fishing permit, and tends to be used for those who refuse to pay penalties and when other remedies fail.

Civil penalty actions resulting from violations are the most common enforcement sanction, followed by citations, seizures and permit sanctions (Tables 2-5 contain data on citations and violations for the nation and regions).

Data on detected violations and citations contained in Table 2 reveal an overall initial decline in violations and citations for the nation as a whole between 1978 and 1980. Between 1980 and 1984, however, there is a dramatic increase. When the data are broken down for violations by foreign and domestic vessels in Table 3, two different patterns emerge: domestic violations increase more than fourfold while foreign violations exhibit no clear cut pattern but rather a series of convilinear fluctuations after an initial decline between 1978 and 1979.

Table 2

Violations and Citations for U.S. and Foreign Vessels
-- National Totals: 1978-1984 *

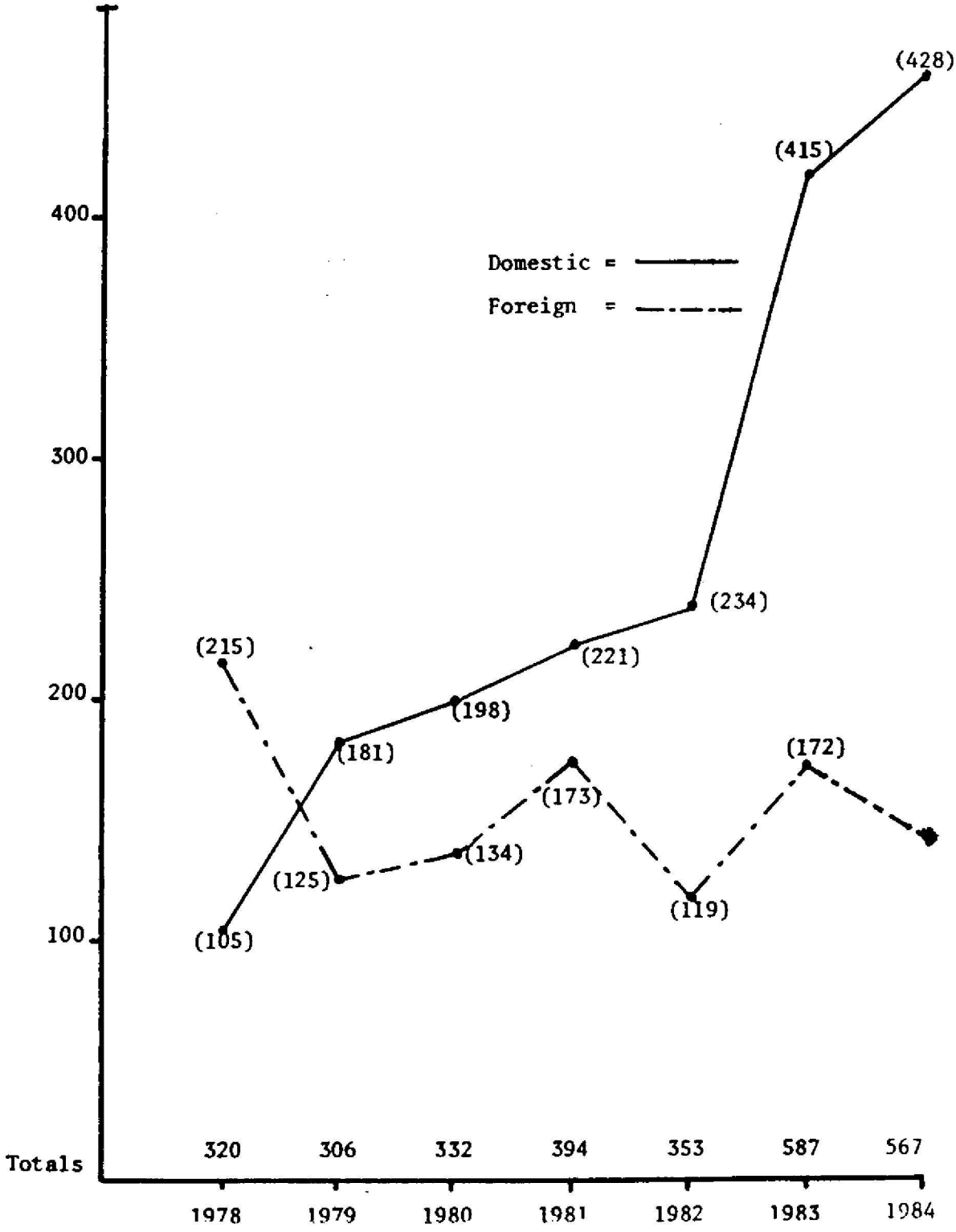


* Excludes dismissed cases.

Source: National Marine Fisheries Service (as of 9/84)

Table 3

Violations for U.S. and Foreign Vessels
-- National Totals, 1978-1984 *



* Excludes dismissed cases

Source: National Marine Fisheries Service (as of 9/84)

When violations are broken down by region in Table 4, the Northeast captures the lion's share of the violations for U.S. vessels. This is partially a function of the Northeast having the largest number of plans initially. As other fishery management plans were added, the percentage of violations captured by the Northeast declines from 81% to 39% but the Northeast region still retains the highest percentage of violations for domestic vessels.

The pattern of violations for foreign vessels by region in Table 5 is somewhat different. The Northeast initially has the lead but is surpassed by Alaska which has the largest foreign fishery. Indeed, in 1983 and 1984, 77% and 60% of the foreign fishery violations took place off Alaska.

In sum, overall detected violations have been on the increase among domestic vessels while the number of foreign fishery violations exhibits no clear cut pattern after an initial decline -- at least there has been no marked increase in detected violations since the advent of the Observer Program.

Expenditures

Expenditures[4] on enforcement comprise a large portion of total federal expenditures on fisheries matters. In FYs 1978 and 1979, for example, Coast Guard NMFS expenditures on enforcement were two and one and one-half times greater than NMGS expenditures on all other budget items (MARMAP, Management Councils, Statistics, etc.).

Table 7 shows Coast Guard and National Marine Fisheries Service expenditures on fisheries law enforcement since FY 1975. Prior to FY 1977 expenditures were entirely for enforcement of other marine

Table 4

U.S. Vessels - Regional Distribution of Violations: 1978-1984*

	1978	1979	1980	1981	1982	1983	1984
Northeast	81% (85)	81% (147)	72% (143)	56% (123)	32% (75)	40% (167)	39% (167)
Northwest	9% (9)	11% (20)	23% (45)	21% (47)	26% (61)	17% (69)	10% (41)
Southeast	1% (1)	4% (7)	1% (2)	13% (29)	23% (54)	31% (130)	33% (144)
Southwest	10% (10)	2% (4)	3% (5)	10% (21)	16% (37)	7% (31)	9% (38)
Alaska	0 (0)	2% (3)	2% (3)	1% (1)	3% (7)	4% (18)	9% (38)
Totals	100% (105)	100% (181)	100% (198)	100% (221)	100% (234)	100% (415)	100% (428)

*Dismissed cases excluded.

Source: National Marine Fisheries Service (as of 9/84)

Table 5

Foreign Vessels - Regional Distribution of Violations: 1978-1984*

	1978	1979	1980	1981	1982	1983	1984
Northeast	46% (99)	15% (19)	22% (29)	42% (73)	57% (68)	17% (30)	23% (32)
Northwest	3% (7)	16% (20)	17% (23)	8% (13)	2% (2)	1% (1)	14% (20)
Southeast	35% (76)	42% (52)	16% (21)	12% (20)	0 0	0 0	0 0
Southwest	3% (7)	1% (1)	5% (7)	20% (35)	3% (3)	5% (9)	2% (3)
Alaska	12% (26)	25% (31)	40% (54)	18% (32)	39% (46)	77% (132)	60% (84)
Totals	100% (215)	100% (123)	100% (134)	100% (173)	100% (119)	100% (172)	100% (139)

*Excludes dismissed cases.

Source: National Marine Fisheries Service (as of 9/84)

resource-related laws (e.g., the Pacific Halibut Fishery Convention, 1953; Fraser River Fishery Convention, 1930; Marine Mammal Protection Act, 1972; Endangered Species Act, 1973). Implementation of the MFCMA in FY 1977 more than doubled enforcement expenditures. The average annual enforcement expenditure for FYs 1977-1983 is approximately $90 million. The trend over the period, however, is uneven, droppping to a low of $58 million in FY 1980, and climbing to $113 million in FY 1983. The high expenditures in FYs 1977 and 1978 reflect Coast Guard expenditures for capital equipment (aircraft, a cutter, support facilities) associated with implementing the MFCMA, amounting to $54.3 million and $20.7 million, respectively (Bell and Surdi 1979, 41-42, 45). The amounts of capital-related expenditures for later years is not known.

The greatest expenditures on fisheries law enforcement are by the Coast Guard, reflecting the relatively high cost of air and sea patrols. In addition to the Coast Guard and NMFS, the Department of State and coastal state agencies engage in MFCMA enforcement activities. Bell and Surdi (1979, 45) indicate the State Department spends about $0.2 million per year as liaison between the Coast Guard and foreign fishing nations. Several state agencies cooperate with NMFS to enforce the MFCMA. No estimates are available for state expenditures on fisheries law enforcement; however, the level of such expenditures is likely a fraction of the NMFS amounts.

NMFS personnel and dollars devoted to law enforcement by region for FYs 1979 to 1982 are given in Table 8. The Alaska and Northeast regions have had the largest enforcement staffs and expenditures, followed by the Northwest, Southeast, and Southwest regions. The National office staff

Table 7

Table 7. Federal Expenditures on Fisheries Law Enforcement (million dollars)

FY	USCG	NMFS	Total
1975	30.1[a]	2.1	32.2
1976	43.0[a]	2.3	45.3
----------MFCMA Enacted----------			
1977	99.3	3.3	102.6
1978	87.7	4.1	91.8
1979	72.5	4.2	76.7
1980	52.4	5.2	57.6
1981	83.8	6.4	90.2
1982	86.8	6.8	93.6
1983	106.0	7.2	113.2

[a]Operating costs only.

Sources: 1975-79, Bell and Surdi (1979).
1980-82, Chappell (1983) and Peterson (1982).
1983, NMFS Enforcement Division

Table 8

Table 8. Percent of National Marine Fisheries Dollars and Personnel Devoted to Law Enforcement: By National Office and Region 1979-1982 (Number of people in brackets)

		1979	1980	1981	1982
National Office		14% (574) [16]	11% (567) [18]	20% (1,290) [9]	19% (1,290) [9]
Northeast		19% (775) [31]	22% (1,135) [31]	21% (1,365) [26]	21% (1,452) [26]
Southeast		13% (508) [12]	12% (638) [15]	12% (758) [15]	12% (776) [15]
Southwest		14% (573) [11]	14% (744) [13]	12% (764) [13]	11% (766) [13]
Northwest		15% (621) [17]	19% (974) [18]	14% (914) [18]	16% (1,103) [18]
Alaska		25% (1,027) [27]	22% (1,173) [25]	21% (1,323) [23]	21% (1,431) [21]
Totals	% =	100%	100%	100%	100%
	$ =	4,051	5,231	6,414	6,818

Source: Peterson (1982)

was almost halved in 1982, but its expenditures more than doubled. The total number of NMFS enforcement personnel fell slightly over the period while expenditures increased. Similar data on Coast Guard personnel and expenditures are not available.

What does the future hold for expenditures on fisheries law enforcement? To answer this question, we draw upon projections of enforcement resources required to enforce fishery regulation anticipated to exist by the mid-1980s. These projections are developed in the "Joint National Marine Fisheries Services United States Coast Guard Fisheries Enforcement Study" (NMFS 1980). The findings of the joint study are summarized in Table 9. The projections anticipate more than twice the number of FMPs and international fisheries agreements than currently are in force. The Alaska and Northeast regions are allocated the largest number of air and sea patrols.

Using cost data given in the enforcement guidelines (NMFS 1982b), the projected enforcement expenditures presented in Table 10 were calculated. A conservative estimate of the total annual operating expenditures (i.e., no capital expenditures are included) is $125 million in 1982 dollars. Sea patrols are by far the most costly component, amounting to nearly $100 million alone. The Alaska region, with its great expanse of sea and high levels of foreign fishing activity, has 43 percent of projected expenditures, followed by the Northeast region with 16 percent and the Northwest region with 14 percent.

In summary, federal expenditures on enforcement have been and are expected to continue to be large, relative to all other federal expenditures on marine fisheries. Annual operating expenditures on

Table 9. Projections of Enforcement Resources Required

Region	Anticipated Number of FMPs & International Agreements	Enforcement Modes		
		Dockside (man years)	Air Patrols (hours/year)	Sea Patrols (days/year)
Northeast	16	51.30	1900	970
Southeast	12	31.81	790	684
Southwest (California only)	6	17.64	838	336
Western Pacific	4	6.62	1102	336
Northwest (Oregon & Washington)	7	57.95	672	624
Alaska	14	31.25	2015	1190
Totals	59	196.57	7317	4140

Table 10. Projected Enforcement Expenditures
(in millions of 1982 dollars)

Region	Enforcement Modes			Regional Totals
	Dockside	Air Patrols	Sea Patrols	
Northeast	2.565	3.800	13.654[e]	20.019
Southeast	1.590	1.580[b]	11.227[f]	14.397
Southwest	.882	1.676[b]	5.076[g]	7.634
Western Pacific	.331	2.732[c]	8.755[h]	11.818
Northwest	2.897	1.505[d]	12.869[i]	17.271
Alaska	1.562	4.514[d]	47.181[j]	53.257
Totals	9.827	15.807	98.762	124.396

[a] @ $50,000/man yr.

[b] @ $2000/hr.

[c] @ $2479/hr.

[d] @ $2240/hr.

[e] 485 dys @ $4440/dy and 485 dys @ $23,712/dy.

[f] 259 dys @ $4440 and 425 dys @ $23,712.

[g] 150 dys @ $4440 and 186 dys @ $23,712.

[h] 92 dys @ $4440 and 352 dys @ $23,712.

[i] 100 dys @ $4,440 and 524 dys @ $23,712.

[j] 1,190 dys @ $39,648.

enforcement likely will increase to exceed $100 million during the latter 1980s. Air and sea patrols by the Coast Guard are the dominant components of actual and projected expenditures; and expenditures are greatest in the Alaska region.

Conclusion

Fisheries law enforcement activities by and large determine the extent of compliance with fisheries law and regulations. Since compliance is directly related to the effectiveness of fisheries management, ceteris paribus, it is often viewed as a meaningful indicator of enforcement performance. Unfortunately, overall compliance is nearly impossible to measure given current enforcement practices and, therefore, actual levels of compliance are unknown. The available data simply measure the extent of detected noncompliance. Of course, if surveillance and monitoring were random, which they are not, the levels of detected noncompliance could be extrapolated to the entire population to provide a measure of overall compliance.

There are a number of methods to improve compliance as Stigler (1970) has noted: 1) minimize the chances that violations will go undetected, 2) maximize the probability that sanctions will follow the detection of violations, 3) speed up the process from the time of detection to the assignment of sanctions, and 4) make the sanctions large. In previous sections of the paper, we presented data which speak to some of these means of improving compliance. Since we cannot be certain about the actual level of compliance, we are forced to examine the level of sanctions over time as an indicator of enforcement activity, albeit, not

necessarily effectiveness. After an initial decline from 1978 to 1980, the number of citations and violations increased annually from 1980 through 1984. For violations only, there were divergent patterns for domestic and foreign vessels. Violations for domestic vessels increased fourfold, while violations for foreign vessels showed no overall trend. The observer program has undoubtedly kept down the number violations by foreign vessels, while the increase in fishery management plans has contributed to the increase in violations by domestic vessels. The Northeast was the region with the largest share of violations for <u>both</u> foreign and domestic vessels. Alaska is the only region where foreign violations outnumber domestic violations.

Annual expenditures on enforcement of the MFCMA exceeded $110 million in 1983 and likely will exceed $125 million by the end of the decade. This expenditure level appears high relative to the potential benefits from U.S. fisheries, which have been estimated to range between $200 million to $500 million annually.[5] Unfortunately, there is no meaningful measure of actual benefits with which to evaluate the existing management and enforcement program. We cannot say whether the current levels of expenditures are justified nor how well the program is working. It is not clear whether society would be better off with more or with less enforcement.

Authorities have come to realize that management and enforcement policies are interdependent and should be set simultaneously. Experience has shown that when management policy is set implicitly assuming costless, perfect enforcement, management objectives are not achieved. Costly, imperfect enforcement affects management policy in at least two ways.

First, as Andersen and Sutinen have shown, costly imperfect enforcement results in an optimal steady-state stock size that lies between the smaller open-access stock size and the larger stock size when enforcement is assumed costless and perfect. That is, overall management objectives must be relaxed somewhat when enforcement is properly considered. Second, the types of management regulations chosen are affected since some regulations are most costly than others to enforce. As shown above, at-sea enforcement operations are significantly more expensive than dockside enforcement operations. Therefore, management regulations restricting how, when, and where fishing is conducted at sea may not be economically justified in some fisheries. Similarly, other regulations, while desirable in a costless, perfect enforcement context, may not be when the realities of enforcement are accounted for.

Notes

*An earlier version of this paper is "Enforcement: The Neglected Element in Fisheries Management," in Miles, et al (eds.).

1. Young (1981) notes that enforcement is only one of the possible bases of compliance. The actual level of compliance may be affected by the attitudes of the fishermen, the incentives of individual firms or enterprises, and the policies of the relevant governemtn agencies.
2. This can be explained as follows. Infractions are detected in a fraction of all boardings. If boardings were random, the fraction would be an unbiased estimate on noncompliance for the fleet as a whole. Since boardings are focused on more likely perpetrators, however, the fraction exceeds that for the fleet as a whole.
3. Personal communication, Beth Mitchell, NOAA General Counsel, Seattle.
4. A number of problems surround the data on expenditures used here. Perhaps the most significant problems is that fisheries law is one set of several that Coast Guard and NMFS personnel enforce.
5. Estimated by Robert R. Nathan Associates, cited in Eckert (1979:51). These estimates are for 1985 in 1983 dollars and, therefore, are not strictly comparable to the expenditure estimates.

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ENFORCEMENT AND SETTING REGULATIONS

by

Pat Carroll

Enforcement Committee
New England Fishery Management Council

On behalf of the New England Fishery Management Council I would like to express my appreciation to Dr. Sutinen for the opportunity to participate in this workshop and present to you some thoughts on enforcement. I would remind you that I am but one of 17 voting members on the Council and that the views expressed generally will be my own and not those of the Council. I would venture to say that the Council, as a group, is probably split with regards to enforcement, with some indicating the level is satisfactory and others not all that satisfied. I do know that one member, who comes from a nearby port, continuously complains about <u>too much enforcement</u> for his fleet!

Inasmuch as my background is enforcement, some 30 years at the time of retirement, I tend to see things a bit differently than most who have not been part of this kind of activity. While my experience has not been in marine enforcement, many of the basic concerns and problems are alike. My remarks will be very general in nature; I will allow those who follow to present facts and figures and the other statistics relative to enforcement costs and specific activities.

Basic, of course, in any operation, and especially enforcement, is financial support for your programs. Not that money solves all problems but certainly it allows one to resolve some to a greater extent than others. It provides the ability and the motivation to get on with the task with a degree of enthusiasm that often, minus the necessary funding, is lacking. When one has an adequate budget to work with, the

flow of the operation is much smoother, is more defined, better understood and certainly, in most instances, more effectively carried out by the people involved. From an acceptable budget, all things being equal, comes a sufficient number of personnel to support the many activities in which an organization is involved, and response to the many requests made to it on a day to day basis. Again, from the same budget, assuming the recruiting and selecting process has been appropriate, comes the ability to train personnel at all levels--without detracting to any great degree from the day to day activities that occur. From personnel we move on to equipment. Personnel, minus adequate equipment, cannot be expected to perform miracles. So we are talking about a budget which allows for sufficient personnel, proper training and adequate equipment. If we add good leadership and supervision one would likely conclude that we have a good organization and operation underway. As a former enforcement officer, I would have to add one more very important ingredient to the above package. Motivation, from both the agency as a whole and the officer as a member of the agency. Minus the proper motivation at both levels, all the money in the world will mean little or nothing relative to how the mission is carried out.

Let's now talk about the agencies that are charged with enforcing the regulations set forth in our various fishery management plans. First, the Enforcement Branch of the National Marine Fisheries Service.

Many of my associates, and certainly I, personally, wonder how the National Marine Fisheries Service accomplishes what it

does these days. And if we talk about dollars and an adequate budget--and I mentioned previously that I would not get into numbers, and I won't--it is obvious to me, and others, that level funding precludes any possibility of adding personnel, providing training opportunities (without depleting day by day operations), and obtaining needed equipment. No one will ever convince me that the 26 agents in our region can effectively enforce all the laws and regulations associated with management plans, let alone the multitude of other areas for which NMFS has responsibility. And that figure, as far as I know, has never been any different; in spite of the fact that management plans continue to come off the drawing boards up and down the Atlantic Coast. I know that training takes place within the agency but it is not hard to recognize that something has to give when an agent spends a week or two on a training assignment, to say nothing of special assignments, sick leave and vacation time. We understand, generally speaking, that the Enforcement Branch is holding its own equipment-wise, except that some agents personally feel a much better job could and would be done relative to "at sea" enforcement if they, NMFS Enforcement, had the craft to carry out this kind of enforcement activity. Some are of the opinion that with proper size vessels this could be done without expanding the present number of agents. Cost of a fully equipped vessel, including maintenance (according to NMFS personnel) runs about $250,000. Multiplied by four for coastline operation amounts to $1M. We recently made some inquiries about this possibility, even suggested that NMFS model its operation, to a degree, after

Canada's--a dedicated enforcement mission. The word came back, "NMFS will not have a Navy!" We are quick to recognize and acknowledge that NMFS Enforcement personnel readily accept the responsibility and carry out their roles relative to enforcement of the regulations within management plans. We also recognize that diminishing budgets, no increase in personnel, and the inability to obtain vessels to put NMFS "at sea" to carry out this type of enforcement activity, coupled with the fact that Councils continue to develop management plans, makes the task at times seem to take on the title of "Mission Impossible." We continue to stretch that elastic band longer and longer and longer and at some point, minus budgetary assistance, that rubber band is going to snap and the hue and cry we hear from many fishermen today that there is no enforcement, will become louder and more widespread. From my own personal experience I know that the Enforcement Branch is working hard to get their job done. During the past year, in particular, I have been with agents at New Bedford, primarily as a result of the concerns expressed by fishermen at that port about scallop sampling procedures and the general manner in which agents were carrying out their duties. It is no laughing matter and not an easy task on the docks, believe me. We have, over the past year, twice changed the scallop sampling procedure in an effort to make regulations more acceptable and by doing so have taken additional agents' time and reduced their ability to check more trips on a daily basis, particularly scallop trips. From these visits with the agents, and other contacts made with them over the years, I can tell

you that they approach their work with a lot of enthusiasm, they are highly dedicated and to a man, extremely qualified for the position they hold. From a "dockside" point of view (with the level of manpower available), NMFS does an excellent job. However, the Council feels that all its plans cannot be designed solely for dockside enforcement and is of the opinion that means must be devised to carry out "at sea" enforcement. This is not only the Council's concern but that of most fishermen who are of the opinion that many fishermen are blatantly ignoring mesh regulations and will continue to do so until there is a strong probability of detection and apprehension. Many acknowledge the Coast Guard, when it has time, does board and check for mesh size, but fishermen know that this doesn't happen all that often.

What I am saying to you is that from a Council's point of view this is an area of deep concern and efforts must be made to provide NMFS with the ability and opportunity to get off the dock and get out to sea to carry out this type of an enforcement action.

Before I leave NMFS I would like to mention another very important aspect of their enforcement program and this involves the assistance rendered by state enforcement agencies. We know that in this region the states have an opportunity to enter into a dollar contract with NMFS to carry out certain enforcement responsibilities in the FCZ and for this, depending upon, of course, the amount of activity they are capable of performing, or the amount they are willing to perform, money is provided in varying amounts to those states who wish to

participate in the program. I think it is generally agreed by those involved in the program and those of us on the outside who hear reports regarding this kind of relationship, that such an exercise is a very beneficial and effective one. To those of us who are part of a Council such a program lends itself to the overall enforcement effort. As I understand it, our region is the only region in which money from the NMFS enforcement budget is made available to states willing to participate in the program. Over the years this money has continued to dwindle and it is quite evident, based on comments we have heard, that this source of funding to the states is rapidly running out. I'm sure reference will be made to this program by others during the course of the workshop. Unfortunately, this comes at a very bad time. Up until very recently, extended jurisdiction (the ability of state agencies to carry out enforcement actions beyond three miles unless accompanied by a federal officer) was not authorized within the contract. Extended jurisdiction for state agencies/officers, may now be included as part of the contract, providing the state requests the authority and is willing to accept the responsibility and liability which goes along with any enforcement action occurring outside three miles. In speaking with various state officers along the coast it was their opinion that with this kind of authority, the level of "at sea" enforcement could become far more effective than most people see it today. However, it has become evident to me that some of these same persons now have mixed emotions about involvement in the program due to the liability aspect regarding injuries, damaged

or lost equipment, and civil actions that may come about as a result of this participation. The question? Why, in carrying out enforcement of federal regulations in the FCZ, must a state assume liability for injuries, damaged or lost equipment, etc.? The benefits derived from such cooperative type programs are untold. Added personnel, equipment, experience, expertise ... it would be most difficult to place a price tag on this kind of assistance, geared towards attaining a higher level of enforcement, both dockside and at sea. This situation surely needs to be looked at with the thought in mind that some states, that today are not part of the program, even though NMFS may run out of money for the contracts, will join with others currently participating. Equally as important as the liability aspect of the contract is that of continuing the flow of adequate dollars for state involvement.

The United States Coast Guard. As one who spent some 27 years of active and reserve time with the Army and is now on the DOD retired list, I find it hard to criticize any department within the military structure of our country. I commend the Coast Guard on its efforts over the past years in carrying out the enforcement of fishery management plan regulations. However, there are many who feel the Coast Guard, because of its multi-mission responsibility, has not been able to adequately attain the level of at-sea enforcement necessary to bring about the compliance so necessary if management of our resources is to succeed. This same group of individuals have advocated--and continue to do so--that money identified by the

Coast Guard as expended for fishery regulation enforcement be taken from their budget and made available to NMFS and the states so that more effective enforcement, especially at-sea enforcement, can take place. As recently as a couple of weeks ago at the ASMFC annual meeting, its Law Enforcement Committee, representing all Atlantic coastal states, suggested as a means of acquiring additional money for enforcement that this money be taken from the Coast Guard's budget. Upon being advised this had been considered by others, specifically the New England Council, and that such an effort would be to no avail, the discussion ended. There exists within the minds of many the feeling that the Coast Guard operates on a priority basis, with fishery patrol and enforcement no higher than number three or four on the list. No one can find fault with these efforts but most are of the opinion that a better program of "at-sea" enforcement must be developed. The cost and time to carry out one boarding is unrealistic. Fishermen will tell you that their intelligence network, relative to the presence of the Coast Guard and the probability of a boarding, precludes, in most instances, an effective off-shore enforcement program. Many are in favor of either or both agencies, NMFS and Coast Guard, using fast, well equipped, nondescript vessels to conduct enforcement activities; similar to the unmarked car on patrol for speeding violations. On the other hand, a like number of people take an opposing point of view, citing the need for high visibility patrol vessels; again, similar to a large number of marked police vehicles in a given area that tend to bring about compliance.

From a personal point of view, the Coast Guard does a good job, and most Council members would agree with that statement. But at the same time, most agree that the agency has too many roles and responsibilities that detract from our immediate concern--enforcement. Before leaving the Coast Guard I must point out that we have been advised by Coast Guard personnel that there is no list which identifies mission priorities. Patrol and enforcement of fishing regulations occurs continuously and concurrently with other at-sea activities. Missions, however, are subject to momentary change for numerous reasons, and frequently what initially is scheduled for fishery patrol may not end up as such. We do know that there is a high degree of cooperation and coordination between NMFS and USCG which results in a very effective enforcement effort; unfortunately, there are limitations to these kinds of exercises. Again there appears to be a very strong feeling for a program similar to Canada's, solely dedicated to the enforcement of fishery management plan regulations. How this might be achieved is an area that is entitled to serious consideration by all who have a concern for enforcement. I think it is also important that we look at the other side of this whole effort. Not so much the enforcement aspect, but from the point of view that enforcement requirements could be maintained at a very minimal required level if regulations first and foremost were acceptable by the fishermen, leading to a satisfactory level of compliance--voluntary compliance. The Council is convinced that regulations that are acceptable to the industry will be complied with by the majority of the

fishing industry. The Council believes that it may not be critical that a regulation be 100% enforceable, especially in light of the admitedly limited capabilities and resources of enforcement agencies. With acceptable management regulations in place, enforcement capabilities can be concentrated on monitoring and detecting those individuals who continue to violate the regulations repeatedly. The Council further believes that management measures which are simple, understandable and consistent with traditional fishing practices may not require a high degree of governmental enforcement to insure compliance by the industry.

However, the Council recognizes there will always be present those who will never comply unless, of course, the penalty is far more than the cost of doing business. Most fishermen with whom we have talked regarding the flagrant offenders, have been quick to advocate and support stiffer penalties. As a result of these discussions and other deliberations the New England Council, in conjunction with NMFS and NOAA General Council, recently proposed a revised penalty plan for the upcoming Multi-Species Fishery Management Plan which cites four major offenses: 1) closed areas; 2) small mesh; 3) sub-legal size fish; and 4) the exempted fisheries program. For the first three violations, second offense (flagrant), the penalty calls for a fine of $5,000 to 25,000, forfeiture of catch, seizure of gear (small mesh) and the initiation of a 60-day permit sanction. A third, flagrant offense calls for the forfeiture of the vessel. The Council is currently working on a revision of the scallop fishery penalty

schedule. If one accepts the premise that at the present time the risk of being caught is minimal, then one must conclude that many will take their chances. Under the old penalty schedule, and from the knowledge that the cost of receiving a citation has been relatively low, those willing to violate were willing to pay a small fine. However, with the above proposed change in the penalty structure, to take a chance, and get caught, will be costly--up to and including permit sanction and loss of vessel.

Over the past years there have been many discussions within the Council relative to enforcement. Similar discussions have taken place at fishermen's forums, special congressional hearings, and surely, at most seaports and fishing piers up and down the coastline. And while there seems to be mixed emotions about the level of enforcement that is occurring, it is generally concluded that the U.S. Coast Guard is the primary at-sea enforcement agency, that for the amount of money expended by the Coast Guard in carrying out this role the numbers of seizures, citations and violations are relatively low. That NMFS basically has no at-sea capability at the present time, that to expect 26 agents to effectively carry out an enforcement program from Maine through Virginia just about falls into the category of "Mission Impossible." That, minus effective at-sea enforcement, perhaps plans should be written that are completely enforceable at dockside. That if regulations cannot be enforced and compliance is minimal, penalties imposed should deter anyone from "taking a chance,"

and surely, the fine imposed should be far more than the cost of doing business.

We, as a fisheries management council suggest:

1. keeping regulations as simple as possible without reducing the likelihood of conserving resources and meeting the objectives of our various plans;
2. devising regulations that are not only understandable to fishermen, but are acceptable to the vast majority of fishermen because they make sense;
3. not accepting the view (relative to enforcement) that because things are done a certain way now (and in the past) they must always continue to be done the same way;
4. ceasing to be so critical of enforcement agencies and striving to support, in whatever way possible, their activities, while keeping in mind our immediate concern is compliance coupled with genuine fishery enforcement efforts on the part of all;
5. striving for a high level of enforcement visibility, personnel and equipment-wise, both at sea and dockside;
6. being innovative and imaginative in seeking more and better enforcement; and finally,
7. seeking active support and explicit industry support for rigorous enforcement and relentless prosecution of violators. If our regulations are logical, reasonable and understandable, I believe we can get such support. Prosecution and penalties must be severe enough that

they are not just another acceptable cost of doing business.

To accomplish all of these things, we should use all available means, starting with resolutions and letters to NMFS, Coast Guard and government agencies and going, if necessary, to the Congress for legislative and budget support. It all won't be changed overnight, but I believe we can change things and I think we must if we are not to fail or to be forced into different, possibly objectionable, management techniques or systems.

Once again, in closing, I want to reiterate that generally speaking the views expressed today were completely personal, and include some that were developed in collaboration with Mr. Douglas Marshall, Executive Director of the NEFMC, who was also scheduled to be part of the program today, but due to a conflict in Council activities asked that I carry on for both of us.

Thank you all very much for listening so attentively to a retired police officer.

FISHERY ENFORCEMENT PROGRAMS

IN MASSACHUSETTS

by

Allan McGroary

Division of Law Enforcement
Massachusetts Department of Fisheries, Wildlife and
Environmental Law Enforcement

The Massachusetts Division of Law Enforcement is the primary enforcement agency for the executive office of Environmental Affairs. It is part of the Department of Fisheries, Wildlife and Environmental Law Enforcement under Commissioner Walter E. Bickford.

We have many duties in addition to fisheries enforcement. These include:

- inland fisheries & wildlife
- recreational vehicles
- hazardous waste
- state forest & parks
- public access regulations.

All of these duties place conflicting demands upon both management and field officers. Fortunately, a recent merging of the Division of Marine & Recreational Vehicles and the Division of Law Enforcement increased our manpower to a level where we can function effectively and even consider new programs.

Manpower

In our recent merger we created a coastal enforcement bureau that includes all coastal towns or cities. There are now six coastal regions, each with five officers and a supervisor. These are in turn under two deputy chiefs who are under a chief of marine enforcement. In addition to the thirty land based positions, there are twelve water based positions. These are divided into four crews of three and man two large

patrol vessels of 45' and 48'. These vessels are crewed 24 hours a day with crews changing every four days. Each shift has a senior officer aboard and each vessel has its own supervisor.

Equipment

In addition to the two large patrol vessels the division has the following boats at their disposal for coastal enforcement:

four 25' Boston Whaler Frontiers,

two 20' Sea Ox,

two 22' Whalers,

one 19' North American, and

one 17' Mako.

Both large vessels are equipped with Radar and Loran C. The Sea Ox's are equipped with Loran C and Radar and Loran is being purchased for the 25' Whalers.

The Division contracts with a privately owned fixed-wing aircraft and has access to two planes. these planes have Loran C and a Division radio with an officer aboard and fly the coast on a regular basis. This eliminates much unnecessary travel by the boats and targets high priority areas. The Division also has one of the largest dive teams in the Commonwealth.

Enforcement Programs

Prior to 1984 both large vessels and seventeen land based officers were allowed the freedom to determine what their daily priorities would be and where patrols would occur. This was allowed under the assumption that the person in the field was

the closest to information sources and most knowledgeable about their district. This system failed to provide effective enforcement because each person established their own priorities depending on their particular interests. They also operated independently and with little coordination.

Beginning in 1984, Division staff outlined all problems involving fisheries enforcement. Ninety percent of the calls for enforcement could be anticipated based on seasonal regulations and fish locations. Each problem and area of occurrence was assigned a priority, based on severity, necessity of enforcement, and importance of the resource. The primary unit responsible for enforcement and the time of occurrence was designated.

The resulting document was distributed to all coastal vessels which were held responsible for concentrating their activities in accordance with the plan. We are now reducing this plan to a simpler assignment sheet that will be easier to read and update. After this enforcement plan was implemented an immediate improvement in response time was noted and regular apprehensions of violators occurred. While some officers regret the loss of freedom they had prior to the plan, they have seen a reduction in complaints and better overall enforcement.

Beginning in 1983 the Division began to compile statistical data that allowed us to identify problems, evaluate the impact of our decisions and document progress. It became immediately apparent there were geographical areas with ineffective enforcement. This allowed us to give special

attention to these areas to correct the problem. This statistical documentation is now in its third year and is providing a data base for better decision making.

Two years ago the Division arranged a statistical study with the University of Massachusetts that evaluated every town in the Commonwealth based on twenty-one characteristics such as population, square miles, land use types and license. This study also evaluated coastal areas for spawning locations, contaminated areas and migratory patterns. We have just received the results of this study and will be looking forward to compiling these data and using them as a basis for reestablishing assigned areas based on work requirements. When computerized, this report will provide a basis for many management decisions.

Another program that has been successful has been the targeting of high complaint activities, such as closed area fishing or night dragging, which has concentrated a large number of personnel on a particular problem or even a particular vessel when that is appropriate.

Coastal enforcement operations can never become routine. If they do they are easily circumvented. We regularly vary our approach to a problem. Using the plane, surveillance in unmarked boats, long range surveillance, camouflaged approaches, such as placing an officer aboard a Coast Guard or other vessel that does not create suspicion, have all been successful. To be successful and create the greatest deterrence we have to be constantly appearing unexpectedly and in a variety of ways. Once a violator is apprehended and

charged the press is used to spread the word and build on the deterrent created. This is very effective at stopping a problem from recurring in that particular area.

To demonstrate the power of the media as an enforcement tool I will relate one incident of our successful use of television. In 1982 the Division had two serious problems. Our statewide strength at that time was forty-nine. Twenty-three vacancies had just been filled to bring us to that level and the impact of this increased enforcement on coastal areas was just beginning to be realized. The legislature saw fit to cut budgets so that twelve of these officers had to be laid off. At approximately the same time several outbreaks of hepatitis occurred in New York State that were traced back to oysters harvested in Massachusetts waters. Another outbreak was traced to contaminated clams. Public pressure was directed at the Division of Law Enforcement for failure to patrol contaminated areas. A television station became interested in this problem and we offered to take them with us on patrol. They were able to film people digging in contaminated areas. They then sampled the markets and tested shellfish they purchased and discovered 50 percent of the clams they had purchased were contaminated. The filming of violators and results of their testing were shown on six different evenings on the evening news. The immediate impact of this news series, called the "Clam Scam," was an almost total shutdown of the clam industry. No one would buy clams. The secondary impact of this news series was money appropriated to bring the Division of Law Enforcement up to full strength. I feel the

proper use of press and media are essential to achieving the full deterrent effect of our enforcement efforts.

The Division is also under contract with the National Marine Fisheries Service to enforce federal regulations beyond the three mile territorial limit of the Commonwealth of Massachusetts by use of off-duty officers on an overtime basis as observers. We participate in federal flights of closed areas. Our two large vessels also patrol with federal agents out to Skowegan and other heavily fished areas for federal fisheries enforcement.

Another important facet of enforcement that is often overlooked contributes to the effectiveness of our programs. Officers and management staff of the Division of Law Enforcement attend almost every meeting of major constituent groups and all public regulatory hearings where law enforcement may be an issue. We are present to answer questions, listen to complaints and explain programs. This presence is welcomed by our constituent groups and contributes to good public relations as well as being a source of information.

In conclusion, I firmly believe that to be effective in any type of enforcement we have to be constantly innovative, we also have to use all the tools available to us to spread the knowledge that we are effective. We have to have sufficient manpower and equipment to be highly visible but at the same time be able to blend so that we can apprehend repeat offenders who are always on the alert. We have to have a good relationship with our various constituent groups, and we have to have a reputation for being fair and unbiased in our

enforcement actions. We have to establish priorities, goals and objectives that provide direction and give a purpose to our efforts. I also advocate getting full participation by field officers on setting tactics and methods as this builds morale and generates enthusiasm. By using all the resources available to us, we can accomplish much with little and provide a vital service to a public and a resource that depends on our efforts.

AN INDUSTRY PERSPECTIVE OF FISHERIES LAW ENFORCEMENT

by

Barbara Duer Stevenson

Otonka, Inc.

When I was asked to present enforcement problems from the fisherman's point of view, I was disturbed at first because I've been out of touch with any progress the councils, NMFS and others may have made the last several months and I didn't want to appear stupid. Then I realized that I was asked to present enforcement problems from the FISHERMAN'S point of view, not from the viewpoint of someone involved in the process. So it doesn't matter if I know why things are or were a certain way.

I do not try to represent all fishermen, but these comments are not solely my own, nor do they totally reflect my personal opinion on all points. Most complaints are a result of:

1) the lack of consistency in enforcement;

2) the lack of practicality of regulations; and

3) inconsistent fines, etc., after a violation.

Lack of consistency in enforcement can take several forms. A current one is that New York has a 14 inch possession law for fluke which they enforce at sea. Thus fluke which were caught legally in the EEZ and which will be landed legally in another state are illegal if one goes into New York waters. While this is actually a lack of consistency in the regulations, fishermen view it as inconsistent enforcement because most other states with size limits enforce them at the dock. Two other current examples of lack of consistency in enforcement are spacial and size differentials. In the enforcement of the Surf Clam Ocean Quahog Plan a significant difference in manpower devoted to enforcement can be seen between New Jersey, which has federally

deputized state enforcement officers and the Delmarva peninsula which does not. Surf clammers both in the New Jersey and the Delmarva area request consistency in the level of enforcement activity "so that they know what to expect...." Vessel owners indicate they need a significant level of enforcement because the temptation is so great on a captain and he is getting so much pressure from his crew that without that consistent enforcement present the owners cannot keep the vessels in check. While it is true the owner can fire the captain and crew he then has to find and train another captain who may or may not do the same thing. There is not an infinite supply of good captains available.

Another example of lack of consistency in enforcement occurs in the groundfish fishery. Vessels in certain areas must use 5-1/2 inch cod ends. Larger vessel owners complain that their vessels are boarded more frequently than smaller vessels both because of the area in which boardings occur and because larger vessels are easier to board. Certain areas do not have vessel boardings because most of the boats are under the optional settlement system. While vessel owners who fish in other areas know this, it is still frustrating to them because they also know that many of the vessels under the optional settlement system are fishing in violation of the system. That there is no enforcement of the optional settlement system because it would take too much effort to catch someone does not satisfy a fisherman. He is not the one who devised the system, he does not write the regulations, and he does not enforce the regulations. All he wants is for

everyone to be treated equally. In areas that have boardings, what seems to happen is that when the fleet first notices the Coast Guard in the area, those who are definitely not fishing legally stop fishing--they either lay to or steam away. They wait for one of the boats still fishing to be chosen; as soon as the Coast Guard chooses a boat the definitely illegal ones go back to fishing. Many vessel owners feel the Coast Guard chooses one of the larger vessels left fishing because they are easier to board. The result of this system is that the boats who at least think they are fishing legally bear the brunt of the boardings while the most obvious violators don't even get boarded. A final example of lack of consistency of enforcement is the relative lack of effort to enforce size limits, etc. on recreational fishermen. This is especially obvious in a fishery like fluke where approximately 50% of the total landings are made by recreational fishermen. In many areas virtually all commercial landings are checked for violations, but little or no effort is directed toward the recreational sector.

In general the fisherman feels that if he has consistent rules with consistent enforcement he can figure out how to work with the system (whether that's to be legal or not is another question).

The most blatent example of lack of practicality of regulations was in the old groundfish plan when at one point there were size limits and a no discard rule at the same time. No fisherman could be legal. Current examples are the optional settlement system, mentioned before, and the regulations

covering possession of whale bones. As I understand it, it is illegal to catch a whale bone. One fisherman suggested to me that it would be as practical to make it illegal for the whale bone to allow itself to be captured. Then, if a fisherman is caught with a whale bone he is written up for a violation and the government can loan the bone back to him. Fishermen are not sure why possession should be illegal, especially as most of the bones they catch are not suitable for skrimshaw. How can anyone expect them to be able to avoid any whale bones in their catch, and why wouldn't a simpler system of tracking possession do the job just as well.

Amendment #1 to the Scallop Plan initially set up a meat size standard that would be impossible for the fisherman to comply with because it was too stringent for the condition under which size is determined on board the vessel. My personal opinion is that the currently proposed meat size standard will be extremely difficult and in practice will be a nightmare, but it is at least better than the original proposal.

Many fishermen see no consistency in the fines, etc., imposed after a violation. They have seen groundfish violations take years after the plan was changed to be resolved and what appears to them to be the most blatent violators get off with only a slap on the wrist. For instance, a large boat in Boston with a series of groundfish violations agreed to tie up for several weeks which happened to coincide with scheduled work on the boat. These same fishermen view the recent settlement of a large collection of surf clam violations as

evidence the system has only gotten worse--the more obvious and coordinated your violations, the less you pay. Fishermen outside of the surf clam fishery point out this settlement as the prime example of the reason for their frustration with the system. This is particularly evident with those who have had little contact with violations settlement because they are relatively honest. Individuals within the surf clam fishery point out this settlement as the new norm for any penalty and cannot see how the government can force anyone to pay more (on a percentage basis). Disgust with the entire enforcement system has increased significantly recently.

In conclusion, fishermen want well thought-out, practical regulations, consistent even-handed enforcement, and a predictable quick and effective system of penalties.

SOME ISSUES IN PENALTY ASSESSMENT

by

James Brennan

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The topic of today's session is problems of Administration and Implementation. Marguerite Matera and Margaret Frailey will provide you an insight into how the FCMA enforcement system operates after a violation is detected, and discuss the problems we face in imposing and collecting penalties. As I view it, my job is to briefly set the stage for their presentations and to suggest a few issues that you might keep in mind as this workshop unfolds.

The Secretary of Commerce has broad discretion under the FCMA to impose any penalty up to the statutory maximum of $25,000 per violation. In assessing penalties, the Secretary is required to take into account the "nature, circumstances, extent, and gravity of the prohibited acts committed and with respect to the violation, the degree of culpability, any history of prior offenses, ability to pay, and such other matters as justice may require." (Section 308(a))

Furthermore, the Secretary has full authority to "compromise, modify or remit" any civil penalty before or after it has been imposed. (308(d)) He can change his mind about the

appropriate penalty amount at any time during the process - even after a final agency decision. There is a notable lack of legislative guidance to the agency in setting or compromising the penalties.

Setting the penalty at the right level is the key element in establishing a workable penalty system. If the penalty is set too low, the fine becomes an acceptable cost of doing business. The fisherman pays when his transgression is discovered, but it does not make economic sense for him to modify his fishing activities so as to comply with the regulations. If the penalty is set too high, the offender is driven to take advantage of every procedural device to extend the penalty process and may well appeal to the District Court. Even after a final District Court judgement, he may resist payment. Collection actions added to the enforcement process can extend the time from detection of the offense to receipt of payment to five or six years. Furthermore, penalties that seem to be unduly high are likely to embroil the agency in controversies with congressmen who believe that their fishermen constituent is being treated unfairly.

To start the process of negotiation or administrative trial, the agency first advises the violator of what it considers an

appropriate penalty. Early in the implementation of the FCMA, the ALJ decided that one-half of the statutory maximum fine of $25,000 was a fair starting point for determining the penalty to be levied in an individual case. This amount would be adjusted upward or downward based upon aggravating or extenuating circumstances.

That approach had the advantage of discouraging litigation since the average domestic offender could usually negotiate a lower penalty with the agency's attorneys before the formal hearing took place. It therefore made good sense not to risk a hearing, especially if the fact of the violation was not seriously contested. From the viewpoint of the offender, it could be viewed as unduly coercive, in that proceeding to a hearing would include a significant risk that the penalty would be increased substantially. This approach has now been abandoned in favor of the view that the penalty proposed by the agency in its Notice of Violation and Assessment document, which presumptively takes into account all the statutory factors known to the agency, is the appropriate starting point.

The first amount that the agency proposes to the respondent in the NOVA document is now the starting point for negotiations or trial. (That amount does not and cannot take into account the financial condition of the individual respondent.)

What are the essential criteria that have to be taken into account in setting a NOVA amount for each type of violation in each regulated fishery? I suggest that the two most important factors that can be determined prior to the time a respondent is given an opportunity to adduce evidence in mitigation are the gravity of the violation and the general economic condition of all participants in the fishery.

We have done a fairly decent job in looking at economic conditions in the fishery. That is, I believe that where the local fishing industry is in some financial distress, the NOVA amount is established at a level lower than it would otherwise be.

I am not quite so confident that the gravity of the type of offense is appropriately factored into the calculus of arriving at a NOVA amount. The gravity of the offense must be related to the effect of the violation on the resource.

Scientists of the Regional Fishery Management Councils and of NMFS' Centers, and Regions should play a role in making this judgment. Up to this point, the scientists of the Councils or, indeed the Councils themselves, have not played a significant role. Perhaps the Councils should routinely advise the agency of the importance they attach to each of the conservation measures in each FMP they develop and submit

to the Secretary for approval. These recommendations would be carefully considered in establishing a penalty schedule designed to withstand the most penetrating unfriendly analysis. In addition to contributing to the establishment of fair penalty levels, this would also assist enforcement efforts by suggesting to the agency where the major part of violation detection efforts should be concentrated. Furthermore, a penalty which reflects a consensus of the Council Members and agency experts established during the time a plan was being developed, may make the penalty level more imperious to political pressures for mitigation which could otherwise be generated.

If everyone believed that we could detect every violation that takes place, penalties could be set at a level slightly higher than the profit that an offender would derive from a violation. Rational fishermen would then refrain from violating the Act. If the detection possibility is perceived to be zero, then, of course, a penalty set at the statutory maximum would not affect behavior of the fishermen. Thus, it is clear that the probability of detection is a factor that should be included in setting penalty levels. At this time, this factor is, to the extent that it is considered at all, is the result of a guess based upon vague impressions

or hunches of agency personnel. This estimate could be refined to something resembling a first order approach by using the data available to the agency. For example, by comparing the number of landings inspected by NMFS agents with the total number of landings in a fishery as determined from the statutes of NMFS we could arrive at the probability of detection. If the probability of detection is 5%, it should attract a penalty twice the amount it would be if the probability of detection were 10%.

The nature of the fishery management plan may also affect the agencies judgment as to where the penalty level should be pegged. Take, for example, the plan governing the East Coast Surf Clam Fishery. The fishery is overcapitalized. The agency chose not to reduce the number of participants in the fishery, but instead chose to limit the time each fishing vessel may fish. Currently, each vessel is limited to a specific six hours of fishing time every two weeks. Each fisherman therefore attempts to make the most of each fishery opportunity - even if it sometimes means violating the size limits or area restrictions in the regulations. If the regulations had reduced entrants in the fishery so that each fisherman had an ample opportunity to fish, the temptation to violate the regulations would be lessened and the agency would have a good basis for establishing higher fines.

In dealing with FCMA violations, we seem to confront "Economies of Scale". That is large scale violations often tend to be more economical to the offender than lesser violations. Somehow, a fisherman who pays a $100,000 fine is thought to have been severely punished even though the NOVA amount for a series of his fifty violations might have been $500,000. A fisherman in the same fishery with one $10,000 NOVA might settle for $5,000. Thus, the small violator pays fifty cents on the dollar while the large scale violator pays twenty cents on the dollar. This doesn't square with the concept that the more grave offenses should attract greater fines. What we see here is a variation on the old saw that a debtor with a large debt is owned by the creditor, but a debtor with a very large debt owns the creditor.

How to correct this anamoly? The answer is simple - by proceeding through the enforcement process from detection of the offense to collection of the fine very quickly. Not only would that transform the large economy-sized violator into a multiple offender, but it would also serve, by providing an example of quick justice, to deter potential offenders. As Ms. Frailey will explain, we do proceed with relative alacrity - but the administrative process does take time, and it cannot be shortened appreciably without compromising the requirements of the Administrative Procedure Act.

Perhaps the most troublesome area in establishing penalties in individual cases is determining "ability to pay". When the offense has been proven and all the other statutory factors seem to weigh against lienency, the last refuge of the offender is "ability to pay".

The burden of proving a lack of ability to pay rests upon the respondent. This is as it should be since he or she is the person with the requisite knowledge of his or her financial condition. Our regulations dealing with ability to pay specify that a respondent will be considered able to pay even if he or she must pay in installments over time, borrow money, liquidate assets or reorganize his or her business. Let me quote the Scrooge provision found at 15 CFR 904.200(e), "The Administrator's consideration of a respondent's ability to pay does not preclude an assessment of a penalty in an amount that would cause or contribute to the bankruptcy or other discontinuation of the respondent's business."

I should add that so far we have not yet forced anyone into bankruptcy by collecting civil penalties. Nonetheless, I am uneasy about how the ability-to-pay provision should be applied. I would welcome a dialogue between the economists and lawyers at this meeting as to how the agency should approach ability to pay. Remember, we are not concerned here with criminal violations, but with acts which merit only a civil penalty.

The offenders are not criminals - they are businessmen trying to run their business at a profit. With that, I turn the discussion over to Ms. Frailey.

PROBLEMS OF CASE MANAGEMENT

Workshop on Fisheries Law Enforcement

University of Rhode Island

October 21-23, 1985

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PROBLEMS IN CASE MANAGEMENT

I. Introduction

I have been asked to address the problems faced by the NOAA General Counsel's Office in moving fisheries enforcement cases through the process of imposing sanctions against violators. This paper will do so, at some length; but first I want to put these problems into perspective.

On the positive side, NOAA's regulations for many fisheries are workable -- that is to say, enforceable -- and enjoy a comfortable level of compliance. The vast majority of enforcement cases are settled without going to hearing. And NOAA's docket of enforcement cases seems to be much more current that those of other federal agencies. 1/

On the negative side, it would be misleading to focus on NOAA's caseload without acknowledging that there are substantial numbers of undetected fisheries violations that never make it

1/ Informal survey of other ALJs by ALJ Hugh Dolan. Among civil-penalty cases decided this year, NOAA cases averaged 13 months between violation and ALJ decision; Fish and Wildlife Service cases averaged 34 months. The other Commerce Department agency prosecuting civil-penalty cases, the International Trade Administration, frequently takes more than five years to reach the final agency decision; NOAA has no cases that old.

into our system. 2/ The Regional Fishery Management Councils have submitted, and the Secretary of Commerce has implemented, a number of wholly or partially unenforceable management strategies. Measures that require at-sea detection, or measurement of 30,000 spiny lobster tails to document a violation, cannot adequately be enforced. Federal regulations that differ from those of adjacent states -- without an ingenious solution such as the American lobster regulations contain -- are equally troublesome.

My diagnosis is that enforcement has often been an afterthought in fisheries management, a postscript to FMPs. Rather than making enforceability an important criterion in choosing among alternate management strategies, some managers seem to assume that fishermen will automatically comply with whatever regulations they promulgate. Even when enforcement problems are pointed out, some decisionmakers persist in preparing unenforceable FMPs. 3/

2/ See, for example, the New England Fishery Management Council's admission that "the management measures of the Interim Groundfish FMP...have not proven to be as effective as anticipated, primarily due to industry non-compliance" (Northeast Multi-Species FMP, p. 7.102).

3/ The Northeast Multi-Species FMP, recently submitted for Secretarial review, is a more elaborate version of the hard-to-enforce Interim Groundfish FMP. Enforcement costs for the Multi-Species FMP have been estimated at almost $17 million per year (the total enforcement budget for the National Marine Fisheries Service is only $6.5 million).

II. Caseload

Still, the cases do flood in. Case files alleging 1,643 violation counts during calendar year 1984 were sent to GC's five regional offices. 4/ An average of two full-time attorneys in each office review their share (or more) of this caseload. There are three basic choices the attorney can make:

1. Initiating the civil penalty process by issuing a Notice of Violation and Assessment;

2. Downgrading the violation to a written warning; or

3. Dismissing the count. 5/

When issuing a NOVA, 6/ the attorney has to be prepared, if the case is not settled, to go to hearing before the

4/ The Northeast office is in Gloucester, Massachusetts; Southeast, in St. Petersburg, Florida; Southwest, in Terminal Island, California; Northwest, in Seattle; Alaska, in Juneau.

5/ See Table 1 for a breakdown of what had happened to those 1,643 counts as of October 1, 1985. "Pending" counts are still under review by GC or have been returned to the Coast Guard or the National Marine Fisheries Service for additional investigation or documentation. Counts for which NOVAs were issued are further divided into those already settled and those still being prosecuted. Dismissed and downgraded counts are lumped together. Table 2 divides these 1,643 counts by which statute was violated.

6/ Table 3 depicts the 833 counts for 1984 violations for which NOVAs were issued, broken down by statute. Some of these counts correspond with the counts in Tables 1 and 2, but some relate to counts referred to GC in 1983.

administrative law judge, 7/ to respond to a petition for review of the ALJ's decision by the NOAA Administrator, and either to defend the final agency assessment in federal district court 8/ or to persuade a U.S. Attorney to file a collection action. In addition to the civil-penalty caseload, the regional attorney must also deal with an occasional vessel seizure, initiate forfeiture actions against seized fish (or their value), review written warnings issued by field agents, and provide advice in criminal prosecutions instigated by NMFS agents.

III. NOAA's Resources

The workload is steadily increasing (NOVAs for 833 counts in 1984 compared with 641 in 1983). How do the attorneys in the regional offices manage this increase? We've been able to hire only two new people in the last few years, one attorney each in Northeast and Southeast. Modern technology helps:

7/ Sometimes travel budgets interfere with our preparedness for hearings. Last spring, motivated partly by budgetary considerations, the General Counsel requested postponement of Lacey Act hearings scheduled for Brownsville.

8/ Suits seeking review of civil penalties have increased from two in 1983 to four in 1984 to 21 so far in 1985.

word-processing equipment, computerized case-tracking, 9/ data-base management, and legal research. Several offices have experienced paralegals or legal technicians to assist. The trouble is the unevenness of the caseload. We can't predict which region will suffer the next bulge in the pipeline. Right now it's the Southeast with Lacey Act cases. Last year it was Alaska with the Nichiro cases. A couple of years ago it was Southwest with tuna/porpoise cases, and before that it was Northeast with the original Groundfish FMP.

My office ("GCEL"), when it was created in 1978, was envisioned as a "strike team" that could rush to the scene when a regional office went into overload. But GCEL has dwindled to four or five lawyers (four at the moment with one on detail), and travel budgets have restricted our mobility. So we do what we can from Washington by drafting briefs and pleadings, preparing administrative records for

9/ The NMFS Enforcement Office developed EMIS (Enforcement Management Information System) in the late 1970s to track important data about each case. The lawyers saw its usefulness and persuaded NMFS to add data to EMIS that would be helpful to GC. Unfortunately, the lawyers took little responsibility for the quality of their data, which of course deteriorated. After a while, no one relied on EMIS to track cases through the civil-penalty process.

After experimenting for a year with a Treasury Department system, we've decided to return to EMIS, make the lawyers accountable for the correctness of the date, and enhance the system's utility for General Counsel.

judicial review, responding to Congressional inquiries, and so on. In the past two years we've had two new kinds of cases, petitions for attorneys' fees under the Equal Access to Justice Act, 10/ and "preemptive" suits in district court trying to keep the ALJ from proceeding with hearings. 11/

In addition to supporting the regional offices, GCEL is responsible for "national enforcement policy," which is a fancy way of saying we're supposed to keep everybody moving

10/ The ALJ rules on these petitions; the Department of Commerce may review them. Fees have been denied in two cases, on the basis that NOAA's position was "substantially justified." Two other petitions are pending before DOC, one in which the ALJ awarded fees and one in which he denied them.

11/ In Nichiro I, the district court issued a temporary restraining order to keep NOAA from withholding 1984 foreign fishing permits until a permit-sanction hearing could be held. Nichiro Gyogyo Kaisha, Ltd. v. Baldrige, D.D.C. No. 84-0012. In Nichiro II, a different judge refused to look at the validity of regulations plaintiffs were charged with violating. Instead, he remanded the case to the agency for administrative hearings. Nichiro Gyogyo Kaisha, Ltd. v. Baldrige, 594 F.Supp. 80 (D.D.C. 1984).

Two other courts in surf clam cases have followed Nichiro II (American Original Corp. v. Baldrige, D.Md. Civ. No. JH84-4694; J.H. Miles & Co., Inc. v. Baldrige, E.D. Va. No. 84-804-N), and the Brownsville court declined to enjoin our enforcement of the Lacey Act against U.S. fishermen shrimping in Mexican waters. Brownsville-Port Isabel Shrimp Producers Ass'n v. Calio, S.D. Tex. Civ. No. B-85-99.

in the same direction. 12/ This we do by holding an enforcement workshop each fall, which almost all the enforcement lawyers attend; looking at copies of each piece of paper those attorneys sign and monitoring their settlement agreements; developing policies and procedures for inclusion in the NOAA Enforcement Operations Manual; reviewing all GC documents submitted to the Administrator; and coordinating NOAA's litigation positions with the Justice Department. We also work on legislation, advise the NMFS Enforcement Office, prepare the Ocean Resources and Wildlife Reporter and the Litigation Status Updates (both quarterly), and supervise two computerized case-tracking systems (without benefit of computer technicians).

Another scarce commodity, besides lawyers, support staff, and travel money, is our ALJ. He's the only one we've got! Judge Dolan holds hearings all over the country and grinds out an amazing number of opinions. But when there's a flash-flood in the stream of hearing requests, the ALJ becomes a

12/ Not that we insist on complete uniformity from region to region. Each region has unique fisheries and enforcement capabilities that dictate different approaches. We encourage each region to experiment; one example is Southeast's development of suspended penalties as an inducement to settlement and a deterrent.

bottleneck. 13/ We have borrowed an ALJ from another agency for a hearing in North Carolina, and the Judge has contracted with a retired ALJ to assist in drafting opinions. Perhaps the addition of the ALJ from ITA will give both judges more flexibility in combating peaks in the caseload.

The ALJ, however, is not powerless in managing his docket. Our procedural regulations give the ALJ considerable authority to expedite hearings and otherwise control the course of proceedings. The ALJ also, as a matter of practice, has developed some effective techniques to reduce congestion in his caseload.

IV. Particular Issues

In this era of belt-tightening, we can't expect to hire more people or get more money to ease our case management problems. But there are some obstacles and inefficiencies that could be removed -- without additional expenditure of resources -- to facilitate the process of imposing sanctions for fisheries violations.

13/ See Table 4 representing the Judge's docket as of September 30. About 63 percent of the 262 cases listed are Lacey Act cases from Brownsville.

A. Better Regulations

Sometimes we get a case where a fisherman has done something he's not supposed to, according to the provisions of the FMP. But we end up dismissing the case or losing it because the regulatory language doesn't quite cover his activity (just one missing word can make a big difference).

For example, we have an FMP with closed areas -- no one is supposed to fish there. The regulations made it illegal for anyone to possess or land fish taken in these closed areas. One day a NMFS agent spotted several boats with gear in the water in a closed area. But, realizing they'd been spotted, the vessels dumped their catch on the way in. The aerial photographs that might have shown fish on board didn't turn out, so we had to dismiss several cases. Now the regulation prohibits fishing for that species in a closed area.

Some things you only learn from experience. The people with the experience are the NMFS agents and the enforcement lawyers. Yet in some regions they're not called upon to contribute to the process of drafting and reviewing regulations. NMFS should fix that; a little attention to the practicality of regulations before they're published could save a lot of headaches later on.

B. Better Documentation

Take another look at Table 1. In the Alaska region, an alarming 41 percent of 1984 violation counts have already been downgraded (3) or dismissed (95). Since these numbers were compiled, GCAK has dismissed another 16 counts. We are investigating this situation; unfortunately, the Coast Guard seems to be the source of most of the invalid cases. 14/ Either their case files described something that's not a violation at all, or the evidence to prove a violation was partially or wholly lacking. 15/

Although they don't yet show up in the statistics, similar experiences with some Coast Guard cases have recently occurred in Northeast. In one case involving a spawning area closure, GCNE had to return a large check representing the seized catch because the file contained insufficient evidence the vessel was fishing at the time it was spotted.

This failure to document cases properly of course has a direct and detrimental effect on compliance, but it also wastes the NOAA lawyers' time. They have to review the case files, write memos on what's wrong with each case, send the files

14/ See Table 5. We were only able to verify the source of Magnuson Act violations in time for this paper.

15/ It is worth noting that, of all the citations the Coast Guard wrote up in Alaska in 1984, only one-third of them were for violations; the rest were only warnings.

back for more documentation, and keep track of the whole process on EMIS. Attorneys in Alaska and Northeast have tried to call this problem to the Coast Guard's attention, but to little avail.

A 1979 report of the Government Accounting Office 16/ noted the Coast Guard's fisheries enforcement problems (competing missions, frequent personnel rotation, lack of law enforcement specialization), and mentioned the problem of unprosecutable cases. The report recommended better training, which presumably has happened. But I would respectfully suggest that the situation won't improve until the Coast Guard stops evaluating the performance of its enforcement units on the basis of number of citations written up, and starts looking at the number of successful prosecutions from those citations. 17/

16/ GAO Report CED-79-120, "Enforcement Problems Hinder Effective Implementation of New Fishery Management Activities" (1979).

17/ It is tempting to fantasize about what NMFS could do with even a small portion of the Coast Guard's budget, $147 million in FY 1985 supposedly spent on fisheries enforcement. Five percent of that budget would more than double the NMFS enforcement budget. With the diminution of foreign fishing, the increase in observer coverage, and some enlightened choices of management measures in FMPs, beefed-up NMFS enforcement efforts could substantially improve compliance with fisheries regulations with little help from the Coast Guard -- for a much smaller price tag.

C. Collateral Challenges

Under the Magnuson Fishery Conservation and Management Act, a plaintiff has 30 days after a regulation is promulgated to seek judicial review of that regulation (16 U.S.C. 1855(d)). If a respondent is assessed a civil penalty, the final agency action may be set aside by a reviewing court only if is "not found to be supported by substantial evidence" (16 U.S.C. 1858(b)).

Yet a number of respondents have attempted to defend against the imposition of civil penalties by challenging the underlying regulations they were charged with violating. 18/ This spring we were treated to the spectacle of a company, which four years earlier had moved heaven and earth to get a minimum size limit imposed on a fishery, trying to convince a federal district court that the size limit conflicted with the Act's national standards. Once the company was faced with multiple charges of possessing fish smaller than the size limit, it decided the limit hadn't been such a good idea after all!

This defense, which is called a collateral challenge, means the enforcement attorney has to compile an administrative record for a regulation that has been on the books for years, and educate a Justice Department lawyer on the

18/ Our regulations do not allow the ALJ to consider the validity of regulations in conducting civil-penalty proceedings. 15 C.F.R. 904.200(b).

FMP and the rulemaking as well as the facts of the violation. No court has yet endorsed this theory of belated challenge as a defense to an enforcement action, but perhaps an amendment to the Act specifically precluding this approach would discourage respondents from trying it. Without an amendment, our litigating position would be more secure if we had more confidence in the defensibility of all the FMPs.

D. Collections

As of October 1, 1985, some 200 respondents owed NOAA more than $1.3 million in civil penalties. Obviously an unpaid penalty is not much of a deterrent! But the collections process is long and tedious; even worse, most of it is out of our control.

Once a civil penalty becomes a final agency assessment, the NOAA lawyer sends dunning letters to the respondent. 19/ Then, after preparing all the necessary pleadings, GC sends the case to the appropriate U.S. Attorney's office for the filing of a complaint, entry of judgment, and enforcement of that judgment. Months go by at each stage of the proceeding.

As you might imagine, debt collection is not the highest priority in any U.S. Attorney's office. At one point the

19/ Soon we will be able to report debts at this stage through a Commerce Department computerized system to other federal agencies that make loans and grants, and to credit bureas.

Boston office had a backlog of 5,000 collection cases from various federal agencies. In a couple of districts NOAA lawyers are Special Assistant U.S. Attorneys, which means they can sign and file the papers they prepared. But most districts are not amenable to such an arrangement. The best we can do is nag the U.S. Attorney's offices and offer them the services of NMFS agents to locate respondents or their assets.

There is one tool that has proved successful in short-circuiting the collections process: permit sanctions. In the Northeast region, a federal permit is required for each fishery under federal management. When a fisherman owes a penalty, he receives a notice from the Regional Director that his permit will be suspended in 30 days if he fails to pay or make arrangements to pay the penalty. 20/ That notice almost always gets results! 21/ The availability of permit sanctions is also one reason we haven't had much trouble settling with or collecting from foreign fishermen.

But the Northeast region is the only one requiring federal permits for all domestic fisheries. The other

20/ Our regulations allow no hearing for a permit suspension on nonpayment, since the respondent has already had an opportunity for a hearing on the violation. 15 C.F.R. 904.304(b).

21/ The Northeast does have considerable outstanding penalties, but these are owed by respondents who never had a permit or who are no longer in the fishery.

regions rely on state permits to identify participants in the federal fisheries, 22/ but state permits apparently can't be suspended for failure to pay a federal penalty.

The obvious solution would be to require federal permits for all fisheries under federal management. 23/ This could be done by the Regional Councils, FMP by FMP, or by the Secretary of Commerce as a measure "necessary and appropriate" for effective fisheries management. It doesn't seem fair that a fisherman should enjoy the privilege of harvesting fish under federal management, if he's unwilling to abide by management regulations and to pay up when he's caught.

IV. Conclusion

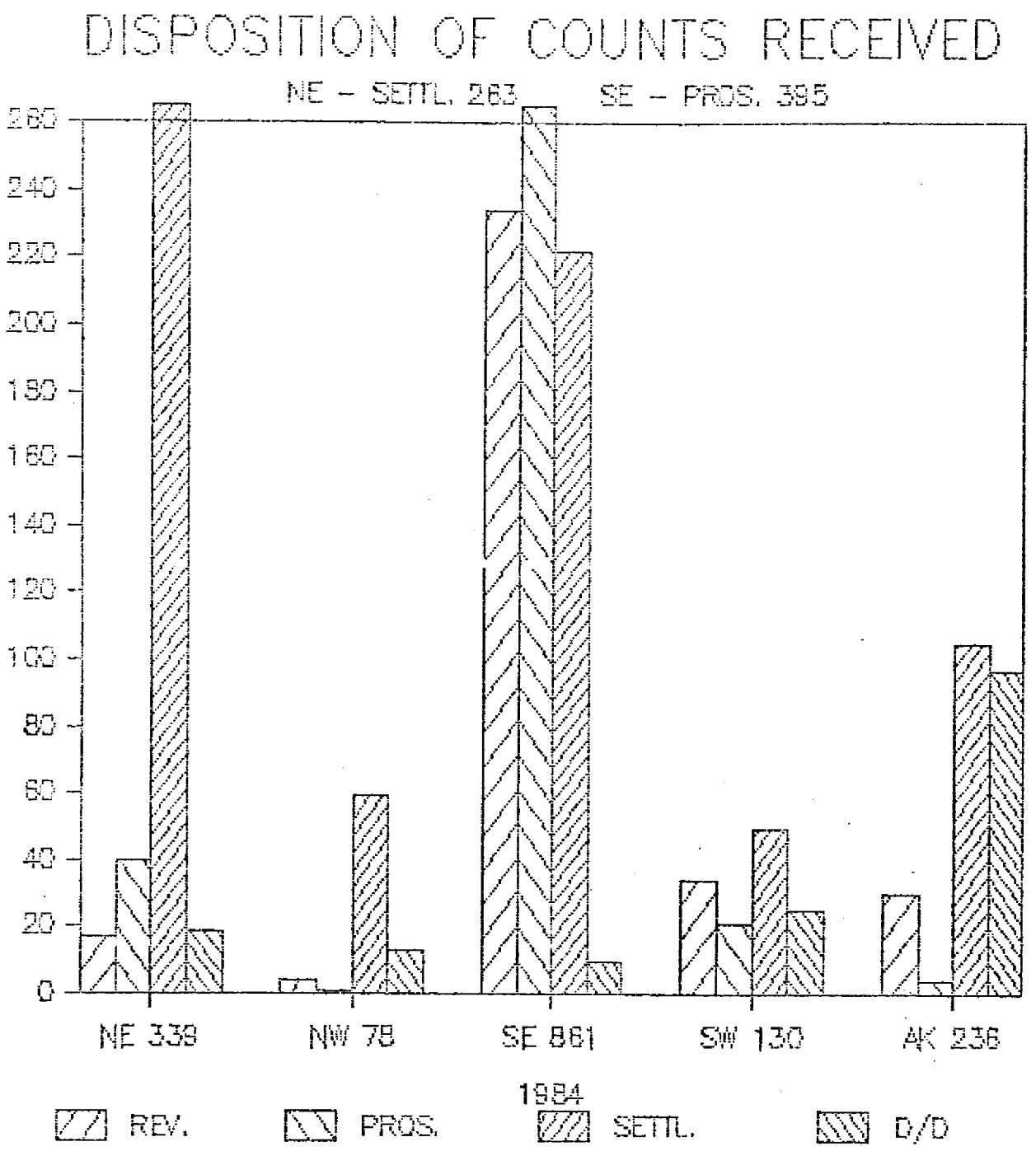
Management of fisheries enforcement cases will never be simple, given the Government's limited resources and the unevenness of the caseload. Tangible improvements could be realized through more attention to regulation drafting and case documentation, elimination of collateral challenges, and the requirement of federal permits in each fishery.

22/ Exceptions: Alaska groundfish and Western Pacific spiny lobster.

23/ This would also make permit suspension or revocation available as a direct sanction for a violation. Because hearing and appeal rights attach to direct permit sanctions, and because fishermen fight so hard to prevent their imposition, direct sanctions probably would be reserved for the most egregious cases.

Table 1: 1984 COUNTS AS OF OCTOBER 1, 1985

Region	Pending	Prose-cuting	Settled	Dismissed/ Downgraded	Total
Alaska	30	4	105	97	236
Northeast	17	40	263	19	339
Northwest	4	1	59	13	77
Southeast	234	395	222	10	861
Southwest	34	21	50	25	130
TOTAL	319	461	699	164	1643
Alaska	13%	2%	44%	41%	
Northeast	5%	12%	78%	6%	
Northwest	5%	1%	77%	17%	
Southeast	27%	46%	26%	1%	
Southwest	26%	16%	38%	19%	
TOTAL	19%	28%	43%	10%	


DISPOSITION OF COUNTS RECEIVED
NE - SETTL. 263
SE - PROS. 395
260
240
220
200
180
160
140
120
100
80
60
40
20
0
NE 339
NW 78
SE 861
SW 130
AK 236
1984
REV.
PROS.
SETTL.
D/D

% DISPOSITION OF COUNTS RECEIVED

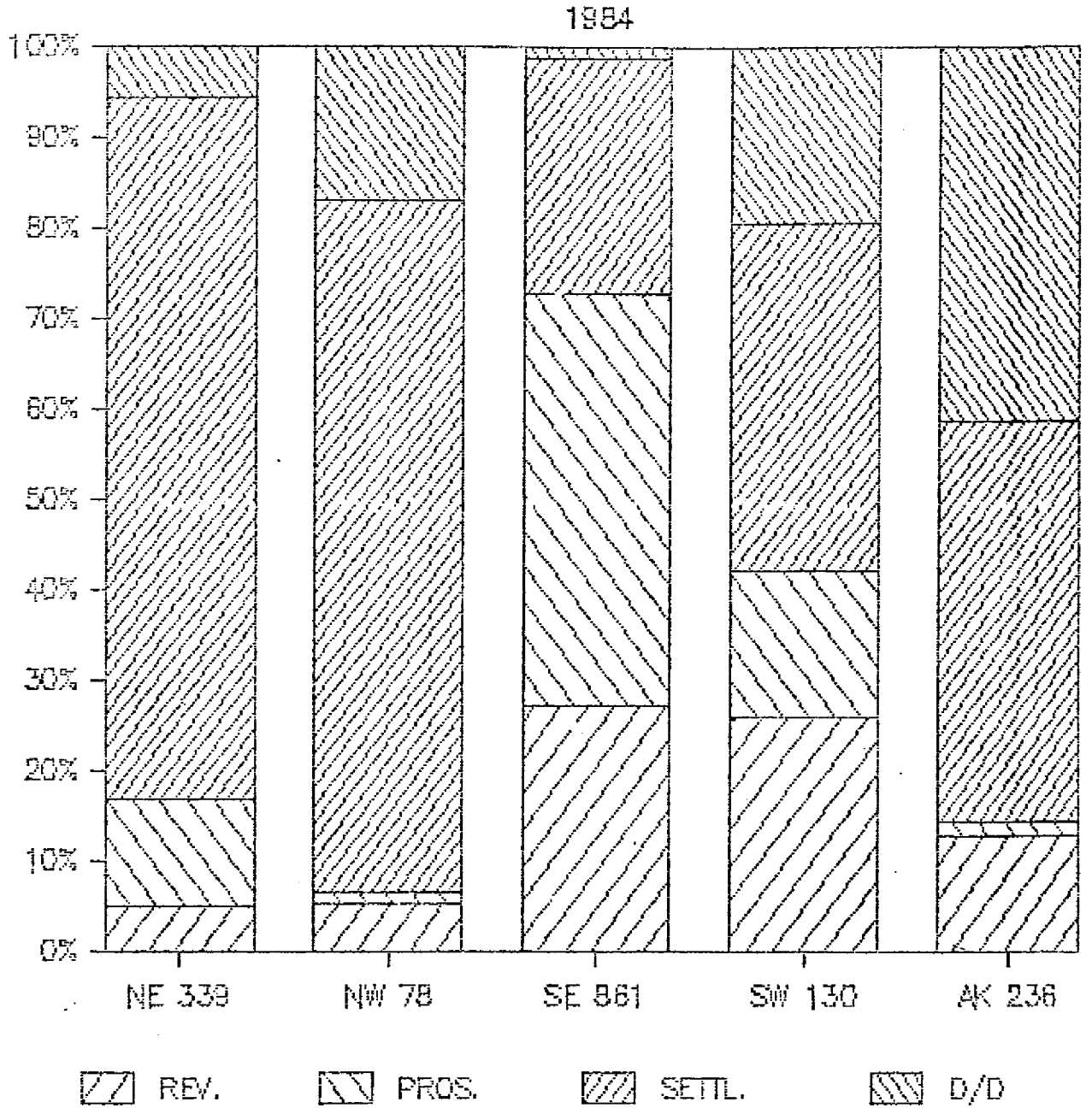


Table 2: 1984 COUNTS BY STATUTE

Statute	AK	NE	NW	SE	SW	Total
Bluefin Tuna		156		4		160
Endangered Species		4	6	21	14	45
Halibut	65		1		1	67
Lacey	3	13	1	657	23	697
Magnuson	160	142	27	136	32	497
Marine Mammal	8	24	42		60	134
Marine Sanctuaries				43		43
TOTAL	236	339	77	861	130	1643

NUMBER OF COUNTS BY STATUTE — 1984

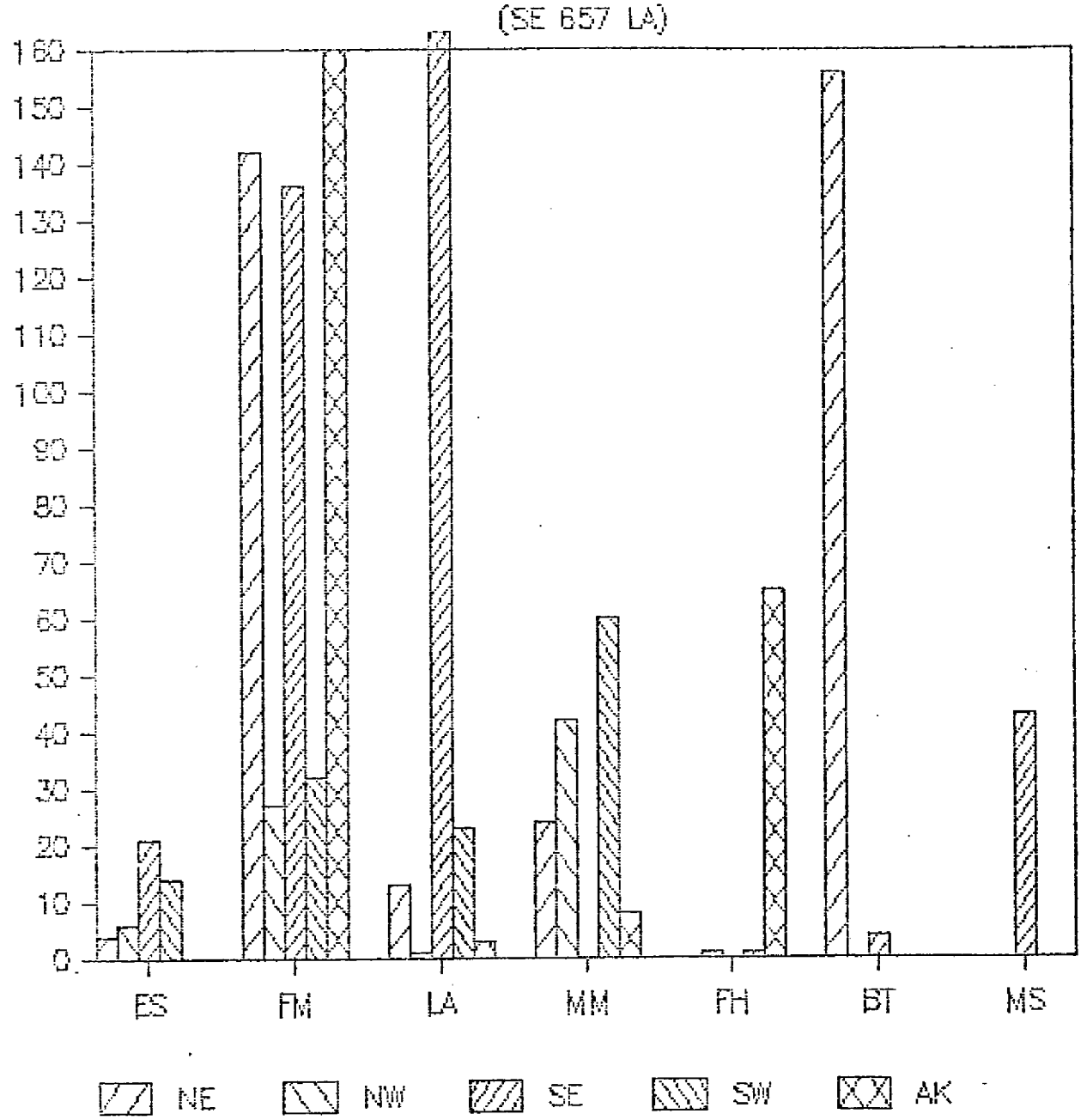


Table 3: 1984 NOVA COUNTS BY STATUTE

Statute	AK	NE	NW	SE	SW	Total
Bluefin Tuna		15		4		19
Endangered Species		2	1	13		16
Halibut	55					55
Lacey		2	1	148		151
Magnuson	69	174	18	120	23	404
Marine Mammal	4	1	7		138	150
Marine Sanctuaries				38		38
TOTAL	128	194	27	323	161	833

Table 4: JUDGE DOLAN'S DOCKET (September 30, 1985)

Non-NOAA	8
Alaska	5
Northeast	31
Northwest	3
Southeast (Brownsville)	165
Southeast (other)	48
Southwest	2
TOTAL	262

Table 5: MAGNUSON ACT COUNTS IN ALASKA IN 1984

(Regional Enforcement Office and General Counsel Review Complete)

	Coast Guard	Coast Guard/ NMFS	NMFS
Prosecuted	19	9	35
Downgraded	8	3	3
Dismissed	31	16	3
Suspended	3		
	61	28	41

The Assessment of a Civil Penalty

Workshop on Fisheries Law Enforcement

University of Rhode Island

October 21 - 23, 1985

Marguerite Matera
Staff Attorney
Office of General Counsel
National Oceanic and Atmospheric Administration
Federal Building - 14 Elm Street
Gloucester, MA 01930
(617) 281-3600

INDEX

ATTACHMENTS

INTRODUCTION

I have been asked to focus on the management of fisheries law enforcement cases from a regional perspective.[1] I have chosen to explain the method of a NOAA enforcement attorney's determination of the proper civil penalty for a violation of a fisheries law or regulation. My choice is dictated to a great extent by my knowledge that the choice of a penalty amount can be the tail that wags the enforcement dog, for picking an amount that is too low may move cases quickly but ultimately provides no deterrent to potential violators and increases the work of enforcement agents and attorneys. Picking an amount that is high, on the other hand, directly increases the amount of time an attorney is required to devote to collecting a penalty, and so is valuable only if there is the perception that this extra effort results in increased deterrence.

I have analyzed the issues for an enforcement attorney by focusing on the process that the attorney uses to assign a penalty amount to an alleged violation of the Magnuson Act.[2] From the enforcement attorney's perspective, there are two steps in the process: first, adherence to the mechanics of civil procedures; and second, application of personal knowledge and experience to the choice of the proper penalty.

The enforcement attorney perceives deterrence as the overriding goal of the National Oceanic and Atmospheric Administration's (NOAA) penalty assessment process; specifically, the deterrence of fishermen from doing those acts which work against the conservation of a fishery. My thesis in this paper is that after close to a decade of enforcing the law, NOAA and its enforcement attorneys have acquired some judgment on what they must do legally and practically to obtain that result. This judgment is applied as an attorney goes through the Magnuson Act's checklist of items relevant to penalty assessment;

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1 I have been a staff attorney with responsibility for prosecution of enforcment cases in NOAA General Counsel's Gloucester, Massachusetts, office since 1980. I have used the acronym for that office, GCNE, throughout this paper.

2 16 USC 1801 et seq; one of eleven statutes enforced by NOAA.

and in making the subsequent legal decisions that are required, such as when to litigate and when to settle a case, why, and for how much. The assessment of a penalty in a NOVA is only the beginning of what the attorney does.

Enforcement attorneys have been processing cases for NOAA for nearly ten years. This means they have developed systems and opinions, expertise on how to assess penalties. They have had time to think and debate about why they do what they do. For example, when they assess a penalty, they believe it is right to factor in the growing body of legal precedent relevant to NOAA cases alongside perceptions of the general level of compliance in a fishery. Since other interested parties may take issue with the way they do what they do, my outline of the enforcement attorney's thought process here may spark profitable critical review.

I. THE MECHANICS OF THE PENALTY ASSESSMENT PROCESS

The United States Coast Guard and the National Marine Fisheries Service (NMFS) are responsible for enforcement of the Magnuson Act. After a violation is documented by either the Coast Guard or by agents from the NMFS, a NMFS agent prepares an Offense Investigation Report (OIR), which names the violator (respondent), describes the enforcement operation, and discusses any pertinent details concerning the particular case. The OIR is forwarded from the NMFS field enforcement office to the Law Enforcement Division at the regional office, where division personnel review it. If the division is satisfied with the OIR it is assigned a case

number and sent to the General Counsel's office (herein GCNE) for prosecution.[3,4]

Once GCNE receives the case, an attorney reviews it to determine whether to prosecute. When the attorney decides that the case is legally sound, the attorney issues a Notice of Violation and Assessment (NOVA). The NOVA is the charging document in all cases. It supercedes any papers issued by boarding officers or investigating officers. The information in the NOVA includes the respondent's name and adress, an allegation of the facts surrounding the violation, the statute and regulations violated, notice of any evidence that was seized, and the amount of the assessed penalty. In addition, the NOVA notifies the respondent of the actions he may take within thirty days of receipt of the NOVA. Attachment 1.

II. LEGALLY REQUIRED CONSIDERATIONS

A. Liability

The attorney's first decision in assessment of a penalty is determining who should bear responsibility for a violation. When NOVAs were first issued in 1977, they charged only the master of a fishing vessel. Since 1980, both vessel owners and masters have been assessed penalties for a violation. Fish dealers and processors and their employees are also now routinely investigated and charged with any violations discovered.

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[3] Pursuant to a delegation from the Secretary of Commerce, the prosecution function is separated from the investigation function. Within NOAA, the Law Enforcement Division is responsible for investigation; the NOAA Office of General Counsel is solely responsible for case prosecution of cases referred by either NMFS or the Coast Guard.

[4] The length of time from the date a violation is detected to the date the OIR is received in GCNE can vary from as little as three days to as long as ninety days. In 1985, the average time elapsing from date of violation to the date the OIR arrives in the regional law enforcement division office is 32.8 days; from the division to GCNE, 25.8 days. (Data supplied by Enforcement Management Information System, Northeast Region, NMFS.)

After determining whether one or more parties will be held responsible for a violation, the attorney decides whether to charge each party in a case separately, or jointly and severally. This decision has two effects: it determines the type of liability of a charged party (respondent) in a case; and it determines the total amount of the civil penalty that is being assessed for a single violation. If two respondents are charged "jointly and severally", they are responsible collectively and individually for the full amount of the penalty. Joint and several assessment of a $5,000 civil penalty, for example, means that one or the other, or both together, must pay no more than $5,000. Charging jointly and severally allows GCNE to maintain flexibility in collecting the penalty, and we intend it to encourage accountability and responsibility in the captain and owner.[5]

However, if two or more respondents are not charged jointly and severally, that is, are charged separately, each individual is responsible for the penalty assessed against it only. The second effect of an individual charge comes in here: a violation assessed jointly and severally against one or more Respondents can carry a penalty of no more than $25,000.[6] A violation charged separately against each of one or more respondents, however, may assess each as much as $25,000.

In deciding the amount of the civil penalty to assess, the attorney must consider the severity of the violation, the past violation history of the respondents, and any mitigating circumstances. [7] These considerations are not optional. They are mandated by the law.

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[5] NOAA's position that an owner can be held responsible for the acts of the master of its fishing vessel has been upheld in administrative and district court decisions.

[6] 16 USC 1858(a)

[7] 16 USC 1858(a): In determining the amount of such penalty, the Secretary shall take into account the nature, circumstances, extent and gravity of the prohibited acts committed and, with respect to the violator, the degree of culpability, any history of prior offenses, ability to pay, and such other matters as justice may require.

B. Penalty Schedules

GCNE does not impose a $25,000 penalty for every infraction of the statute or regulations. It has developed penalty schedules for each fishery[8], which serve to keep attorneys from being arbitrary or capricious in their assessment of penalties against respondents who commit similar violations. A schedule sets a range of penalties applicable to a certain violation; what that range is depends upon the type of violation and the number of prior violations by that respondent. The goal is to have in use a schedule of fines whose impact on an individual is fair, yet which provides a sufficient impact to deter potential violators. Where it is appropriate, penalties are sensitive to the value of the particular fishery by requiring two components for calculation of a penalty: the first component is the value of the illegal fish that were involved in the violation; added to that is the penalty amount suggested for that violation.

The range in a schedule is lowest for a first-time violator of a "technical" regulation, while a first-time violator of a major plan term incurs a higher range of penalties. The range for both types of violations increases as the number of repeat violations increases. However, no penalty schedule is rigid. An attorney may go above or below the assigned penalty range to account for articulable aggravating or mitigating circumstances.

C. Severity of the Violation

Each set of regulations promulgated pursuant to a fishery management plan incorporates some standard technical provisions, such as a requirement to carry

[8] See Attachment 3, the penalty schedule for Atlantic groundfish. Schedules are revised from time to time when change is indicated. See Attachment 4, the penalty schedule proposed by the New England Fishery Management Council for the Northeast Multispecies FMP.

or to display a permit, or to have numbers of a certain size permanently affixed to the boat. While an attorney could assess a penalty of $25,000 for this type of violation, there is no compelling reason to do so. GCNE believes that though these regulations are not critical to the resource, they aid the enforcement of the major regulations and do deserve some penalty, so typical fines range from $50 to $500. These cases are rarely adjudicated. Both respondents and NOAA prefer to settle them, with one condition of the settlement being that the violation is remedied. Because GCNE has limited resources, it is implementing a more efficient method for handling this type of violation, the summary settlement schedule.[9]

The critical or major regulations are those that embody the major conservation provisions of the fishery management plan. Fines for violations of these regulations range from $1,000 to $25,000, plus the value of seized illegal fish. These are the cases which require the most careful and supportable choice of civil penalty: these are the most visible cases, the ones that get litigated, and the ones that must send the deterrence message to other participants in the fishery. They comprise the bulk of the enforcement attorney's workload, and because of their significance to fisheries management, stimulate constant debate as to the level required for "deterrence."

D. Past History of the Violator

Various factors influence an attorney's determination of whether a violator is a repeat violator. When a respondent has received a prior warning or citation, GCNE considers it an aggravating factor which may push the penalty toward the upper end of the range, but does not consider it the equivalent of a prior violation.

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[9] The summary settlement schedule is similar to a parking ticket. A violator is given a Notice by an enforcement agent that a certain technical violation has been documented. The violator has so many days after receipt of the Notice to pay a set penalty listed on the Notice. Only after that time period has elapsed without payment being received is the violation referred for a NOVA.

When a violator has an older but as yet unresolved case[10] GCNE considers it a prior violation. There are several reasons for this. First, GCNE does not want to encourage violators to keep cases unresolved so they might be considered "first-timers" forever. Second, prior cases may be resolved during the pendency of a current case. It is difficult at that point to revise a penalty upward if the resolution has established liability for the prior violation.

The penalty schedules are not specific as to whether a proper violation for consideration as a "prior" is only an identical prior violation. Arguably a prior violation under the same plan can also be considered; possibly any prior violation of the Magnuson Act or a related state or federal statute could properly be considered. The schedules do not state how long a prior violation should be "kept on the books" for penalty assessment purposes. GCNE's rule of thumb is that any violation resolved within the past five years is relevant; the New England Fishery Management Council adopted that same length of time in its recommended multispecies penalty schedule.

In many cases the past violation histories of the parties to a violation are different. The owner of a vessel may have several prior violations while the master is a first time violator. In that situation GCNE issues a NOVA to the owner and master separately, so that the penalty amount can be tailored to the prior violation history of each.

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[10] Unresolved in the sense that guilt or innocence has not yet been finally adjudicated; this is any status prior to an admission of guilt or a final determination of guilt by an administrative or appeals court.

E. Ability to Pay

Although the attorney is required to consider a violator's ability to pay, that ability is not usually known to the attorney at the time a NOVA is issued. That ability is known only to the violator, and as a consequence, is considered in mitigation of the originally assessed penalty when it is brought to the attention of the attorney. NOAA has recently published regulations which explain the types of information on ability to pay that it will consider.[11]

F. Mitigating Circumstances

The last consideration for the attorney is whether or not there are any mitigating circumstances in the case. This is a catch-all category which is limited only by the imagination of the respondent. Like ability to pay, mitigating circumstances are often not known to the attorney until after a NOVA is issued.[12]

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[11] Ability to pay may be obvious from documents submitted by a sole propietor or small partnership. In some cases involving large corporations filing consolidated tax returns, GCNE has had to seek the help of the NMFS Financial Services branch and the Department of Justice antitrust division to determine ability to pay.

[12] When they are made known, they can vary from the valid to the fanciful. Each of the following has been alleged in mitigation to an attorney in GCNE: mistake; lack of knowledge of the law; bad weather; faulty instruments; attempting to comply with the law, but falling short; lack of knowledge of English; minimal or no financial gain from the act; lack of control over the party committing the act; incurable disease; youth; age; insanity; and finally, giant waves. Under the right set of facts, it is possible that any one of these seemingly wild and unrelated facts could blunt the need for deterrence, or at least deterrence by imposition of a civil penalty.

Deciding whether or not a mitigating circumstance is troublesome for the enforcement attorney. As nonspecific as it may be, however, the Magnuson Act requires the attorney to consider "such matters...as justice may require."

III. CHOOSING THE AMOUNT

A. Philosophy

Having considered all of the required factors listed above, the last considerations for the attorney are tactical. They develop from a philosophy about how the case should go -- whether it should be settled, or litigated. For reasons like limited manpower, settlement is an appropriate goal for a case in which the facts are not unique, or do not raise issues which need to resolved in a judicial forum. The attorney and the public both perceive benefits from a quick resolution, and from limiting the amount of resources needed to resolve the case. Knowing this there is a dilemma for the attorney. Though s/he knows that s/he wishes to resolve the case by settlement, should the penalty be structured to obtain that result? Is that an appropriate consideration, or is it arbitrary and capricious? The attorney knows that settlement for 50% of an assessed

penalty is acceptable to NOAA, and that most cases settle. Does that mean that the appropriate penalty is twice what the attorney is willing to settle for? Is that going to be a deterrent? GCNE attorneys are not perfectly accurate in determining which cases will be resolved by settlement. That means that if a penalty is assessed on a settlement theory, a certain number of cases will be over-assessed. Is that acceptable?

Enforcement attorneys are often criticized by fisheries managers for not assessing penalties which are severe enough. An attorney develops a sense of the penalty level in each fishery at which more respondents will choose to litigate rather than to settle; this can be a difference of as little as $2,500. This means that to some extent an attorney can make a conscious decision to get into litigation. The enforcement attorney's perception is that the decision to litigate is only required in fisheries in which settlement and seizures of fish have not had a deterrent effect. It is a decision with ramifications: litigation prolongs the resolution of an issue. It does not have the quick result which is thought to be important in changing the behavior of the violator and other fishermen. It can literally tie up the attorney for months. It usually causes political furor; in the past it has led to challenges of the underlying fishery management plan. The attorney hopes to be correctly perceiving the need when s/he chooses to engage a violator in litigation. Mostly because an attorney's resources are finite, there can never be a determination to litigate every case -- to the dismay of many observers.

But whose perception is correct? The fishery manager's or the attorney's? This is an area in which the lack of ability to determine level of compliance or effectiveness of deterrence inhibits the effectiveness of the penalty imposition process.

CONCLUSION

GCNE has experience in the enforcement of fisheries regulations. It constantly seeks feedback on the effectiveness of what it does. It adds new forms of penalties when they suggest better deterrence: there is growing reliance on the use of suspended penalty amounts -- a form of probation -- to obtain long term compliance. Permit sanctions are also increasingly valuable as penalties, and as mechanisms to enforce collection of civil penalties.

Yet there is no empirical way for GCNE to determine if the penalties it assesses are too high, too low, or just right. Focusing on level of compliance is misleading, because the overall level of compliance depends on more than potential liablity for penalties. It also depends on ability to comply with the current regulatory scheme, and the factors noted by Stigler (1970).[13] Level of compliance itself is impossible to determine, as noted by Sutinen and Hennessey (1984). [14] Lack of recidivism may be an indicator of successful deterrence, or it may indicate that the violator has gone to greater pains to avoid detection. Quick settlement may be opportunistic rather than optimum for changing behavior.

GCNE is among those who seek adequate mechanisms for feedback to those whose responsibility in managing a fishery is in enforcing compliance with management plans.

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[13] Stigler, G. 1970. "The Optimum Enforcement of Laws" J. Polit. Econ. 78:526-536

[14] Sutinen, J. and Hennessey, T. 1984. "Enforcement: The Neglected Element in Fishery Management"

Office of General Counsel
14 Elm Street, Gloucester, MA 01930

F/V
NE
ITEM(S) SEIZED:

DATE:
CERTIFIED MAIL NO.: P502105

Certain activities, as alleged in the enclosed NOTICE OF VIOLATION AND ASSESSMENT (NOTICE), were deemed to be in violation of the Magnuson Fishery Conservation and Management Act, 16 USC 1801 (the Act). The particulars of the alleged violation(s) were forwarded to the National Oceanic and Atmospheric Administration for issuance of a NOTICE.

The enclosed NOTICE charges you with (a) violation(s) of the Act and assesses against you a civil monetary penalty for such (a) violation(s). This is a civil administrative action. It is not a criminal procedure. The NOTICE and the enclosed copy of 15 CFR Part 904 (which are the applicable Federal regulations governing civil procedures) explain your rights. READ THESE DOCUMENTS CAREFULLY.

You have 30 days from your receipt of this NOTICE either to file a written request for a hearing before an Administrative Law Judge, who has the power to decide whether or not a violation occurred, and to assess a penalty which may be higher or lower than the ASSESSED PENALTY in this NOTICE, or to take other action provided for in the NOTICE and Federal regulations. If you have taken no action by the end of the 30-day period, the NOTICE will become the final administrative decision enforceable in any United States District Court. IF YOU ARE CHARGED JOINTLY AND SEVERALLY IN THIS NOTICE, A HEARING REQUEST BY ONE NAMED RESPONDENT WILL BE DEEMED TO BE A HEARING REQUEST ON BEHALF OF ALL RESPONDENTS. This means that ALL Respondents will be bound by the decision of the Administrative Law Judge.

If you wish to conclude the matter at this time, sign the AGREED DISPOSITION which appears below. By signing the AGREED DISPOSITION you will relinquish your rights to the above-named item(s) which has (have) been seized from you in connection with this alleged violation. You must also enclose a check or money order made payable to: "Treasurer of the United States" in the amount of $1,500. This case will then be closed.

You are further advised that the offense(s) charged is (are) of a nature which may warrant action in accordance with 15 CFR Part 904 Subpart D (Permit Sanctions and Denials) against the permit issued to the above-named vessel under the provisions of 50 CFR §651.4(j). Failure to pay the total ASSESSED PENALTY for all counts after it has become final under 15 CFR 904.104(a) will result in suspension of the fishing permit issued to the above-named vessel.

AGREED DISPOSITION: I do not wish to contest this NOTICE OF VIOLATION AND ASSESSMENT. I hereby waive my right to a hearing and relinquish and transfer to the United States all right, title, and interest in any items listed in the NOTICE as seized. I have enclosed payment (by check or money order payable to the "Treasurer of the United States") of the penalty assessed. I take this action on the understanding that it is a settlement of all charges, claims, and complaints against me by the United States resulting from the incident(s) desscribed in this NOTICE OF VIOLATION AND ASSESSMENT.

_____
DATE

_____
Signature of Respondent or
Authorized Representative

UNITED STATES DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

MAGNUSON FISHERY CONSERVATION AND MANAGEMENT ACT

NOTICE OF VIOLATION AND ASSESSMENT OF ADMINISTRATIVE PENALTY

ISSUED TO: with CERTIFIED MAIL NO.

AND

with CERTIFIED MAIL NO.

VESSEL: F/V CASE NO.

FACTS CONSTITUTING VIOLATION S:

On or about , employees, agents or representatives of , owner of the fishing vessel F/V , including , the vessel's Master, all being persons subject to the jurisdiction of the United States and named as the Respondents herein, unlawfully

STATUTE/REGULATION/PERMIT VIOLATED: Magnuson Fishery Conservation and Management Act, §307(1)(A), 16 USC §1857(1)(A) 50 CFR 65 .
( )
Permit No.

ASSESSED PENALTY: $

JOINT AND SEVERAL LIABILITY: This ASSESSED PENALTY is assessed jointly and severally against XYZ. Both XYZ jointly, and each of you individually, are liable for the total ASSESSED PENALTY for all counts. Whether one of you pays the entire amount or both of you pay equal or unequal portions of the total ASSESSED PENALTY is for XYZ to determine. This case will not, however, be closed against either of you until the total ASSESSED PENALTY amount is paid.

FINDINGS, CONCLUSIONS, AND ORDER: Having considered all of the facts and circumstances presented in this NOTICE and taking into account the criteria for determining the amount of the ASSESSED PENALTY as provided in 16 USC §1858(a), I do hereby find and conclude that the Respondent(s) did violate the Magnuson Fishery Conservation and Management Act, 16 USC §1857, as alleged, in every particular, and that a just and reasonable assessment for such (a) violation(s) is the ASSESSED PENALTY above. IT IS SO ORDERED.

NOTICE: This is your official notice of violation(s) and assessment of administrative penalty described above. This is not a criminal action. You, your attorney, or other representative have 30 days from the date you receive this NOVA to respond. During this time you may:

(1) Accept the ASSESSED PENALTY by signing the AGREED DISPOSITION above and making payment by check or money order made payable to the "Treasurer of the United States" at:

Office of General Counsel
National Oceanic and Atmospheric Administration
Federal Building, 14 Elm Street
Gloucester, Massachusetts 01930
(617) 281-3600, extension 231

(2) Seek to have this NOTICE modified to conform to the facts or the law as you see them, by contacting the Attorney listed below at the address set forth in paragraph (1) above;

(3) Request a hearing (like a trial) before an Administrative Law Judge to deny or contest all, or any part, of the violation(s) charged and the ASSESSED PENALTY imposed. Such request must be dated and in writing, and must be served either in person or by certified or registered mail, return receipt requested, at the address set forth in paragraph (1) above. The request shall either include a copy of this NOTICE or refer to the case number appearing in the heading to this NOTICE. IF YOU ARE CHARGED JOINTLY AND SEVERALLY IN THIS NOTICE, A HEARING REQUEST BY ONE NAMED RESPONDENT WILL BE DEEMED TO BE A HEARING REQUEST ON BEHALF OF ALL RESPONDENTS. This means that ALL Respondents will be bound by the decision of the Administrative Law Judge. You may also;

(4) Take no action, in which, case this NOTICE shall become final in accordance with 15 CFR §904.104.

For good cause shown, you can, within the 30-day period specified above, request an extension of time to respond, not to exceed an additional 15 days.

WARNING: IF YOU SHOULD FAIL TO EXERCISE YOUR RIGHTS WITHIN 30 CALENDAR DAYS FOLLOWING RECEIPT OF THIS NOTICE, ALL OF THE ALLEGATIONS AND THE PENALTY HEREIN WILL BE TAKEN AS ADMITTED AND THIS ASSESSMENT WILL BECOME A FINAL ADMINISTRATIVE ORDER ENFORCEABLE IN ANY UNITED STATES DISTRICT COURT, as provided in 16 USC §1858, The Magnuson Fishery Conservation and Management Act, as amended, and the implementing regulations in 50 CFR cited above.

THE ENCLOSED REGULATIONS GOVERN THESE CIVIL PROCEDURES AND EXPLAIN YOUR RIGHTS. READ THEM CAREFULLY.

For the Secretary of Commerce

_____
DATE

_____
Marguerite Matera
Staff Attorney, National Oceanic and Atmospheric Administration

Office of General Counsel
14 Elm Street, Gloucester, MA 01930

RE:

Dear

On you were issued Enforcement Action Report No. for under the Atlantic Tunas Convention Act of 1975.

We have reviewed the circumstances of the violation s charged against you. Based upon that review, we have determined that it would not be in the best interests of the Government to prosecute this violation further. However, this letter is a written warning notice that a violation has been documented and that a subsequent offense, including but not limited to, a violation of the same statute or an offense involving an activity that is related to the prior offense, may be treated more severely. It may also be used in determining what action, if any, should be taken in future violations controlled by the same entities.

This letter is a written warning or citation under the Atlantic Tunas Convention Act of 1975, 16 USC §971 et seq. and the regulations at 15 CFR Part 904 - Subpart E. If you believe that you should not have been given a written warning you may, within 90 days of your receipt of this written warning or citation, submit in writing the facts and circumstances that explain or deny the violation described in this warning to the following address.

Regional Attorney
Office of General Counsel
14 Elm Street
Gloucester, MA 01930

If you do not agree with the decision of the Regional Attorney after you have received it, you may appeal that decision within 30 days from when you receive it to:

NOAA Assistant General Counsel
for Enforcement and Litigation
Page 1 Building - Room 275
2001 Wisconsin Avenue, NW
Washington, DC 20235

The Assistant General Counsel for Enforcement and Litigation may, in his or discretion, affirm, expunge, or modify the written warning and will notify you of the decision. That decision constitutes the final agency action.

This case is closed unless you seek the review described above.

Sincerely,

Marguerite Matera
Staff Attorney, NOAA

Enclosure: Copy of 15 CFR Part 904 - Subpart E (§904.400-904.420)
-- 40 FR 1036 (January 6, 1984)

CERTIFIED MAIL NO.
RETURN RECEIPT REQUESTED

Interim Atlantic Groundfish Plan - 50 CFR Part 651

(All figures X $1,000)

Violation	1st Viol.	2nd Viol.	3rd Viol.	4th Viol.
Small mesh*	1-2.5	2.5-5	5-10	10+
Closed area*	2.5-5	5-10	10-20	25+
Violate provision of optional settlement program, including record keeping and reporting*	1-2.5	2.5-5	5-10	10+
Groundfish smaller than minimum sizes				
-- Dealer*	1-2.5	2.5-5	5-10	10+
-- Fisherman*	.5-1	1-2.5	2.5-5	5+
Fishing without permit*	1-2.5	2.5-5	5-10	10+
--without permit on board	.5-1	1-2.5	2.5-5	5-7.5
Failure to report change in permit information	.25-1	.75-1.5	1.5-5	5+
Refuse permission to board a vessel	2.5-5	5-10	10-17.5	18-25
Intimidate or assault an Authorized Officer	5	5-10	10-17.5	18-25
Resist arrest	5	5-10	10-17.5	18-25
Interfere with lawful investigation	1-2.5	2.5-5	7.5-10	10+
Failure to obey				
Coast Guard signals	5	5-10	10-17.5	18-25
--in a timely manner	.5-1.0	1-2.5	2.5-5	5-10
Failure to provide safety equipment for boarding party	1-2.5	2.5-5	5-10	10+
Failure to maneuver safely	1-2.5	2.5-5	5-10	10+
Interference with boarding party	2.5-5	5-10	10-17.5	18-25
Failure to permit inspection of gear	1-2.5	2.5-5	5-10	10+

*Plus value of illegal fish. If value undeterminable, $5.00/individual fish.

Atlantic Groundfish—continued

(All figures X $1,000)

Violation	1st Viol.	2nd Viol.	3rd Viol.	4th Viol.
Making false statements to an Authorized Officer or the designee of the Regional Director	1-2.5	2.5-5	5-10	10+
Failure to affix or maintain proper vessel markings	.1-.5	.5-1.5	1.5-5	5+
Transfer U. S. harvested fish to nonpermitted foreign vessel within FCZ	2.5-5	5-7.5	10-15	20+
Dealer				
Failure to maintain records on all transfers, purchases and receipts of fish	1-2.5	2.5-5	5-10	10+
False records of transfers, purchases or receipts of fish	2.5-5	5-10	10-17.5	18-25
Possession, custody, control, shipment, transportation, offering for sale, selling, purchasing, landing, importing or exporting groundfish taken in violation*	1-2.5	2.5-5	5-10	10+

*Plus value of illegal fish. If value undeterminable, $5.00/individual fish.

NEW ENGLAND FISHERY MANAGEMENT COUNCIL

Multi-Species Fishery Management Plan

Draft Penalty Schedule[1/]

Offense/Violation	First Offense	Second Offense	Third Offense	Fourth Offense
Closed Area:				
Flagrant >1/2 Mile	$2,500-10,000 Fine Forfeit Catch[2/]	$5,000-25,000 Fine Forfeit Catch Initiate 60-day Permit Sanction	$10,000-25,000 Fine Forfeit Catch Forfeit Vessel	
Simple <1/2 Mile	Citation	$1,000-2,500 Fine	Follow Flagrant Schedule Beginning with First Offense	
Small Mesh:[3/]				
Flagrant >1/2 Inch	$2,500-10,000 Fine Seize Gear Forfeit Catch	$5,000-25,000 Fine Seize Gear Forfeit Catch Initiate 60-Day Permit Sanction	$10,000-25,000 Fine Seize Gear Forfeit Catch Forfeit Vessel	
Simple <1/2 Inch	$1,000-2,500 Fine Seize Gear	Follow Flagrant Schedule Beginning with First Offense		
Sub-Legal Size Fish:				
Harvestor				
Flagrant >50 Fish	$2,500-10,000 Fine Forfeit Catch of Undersized Fish	$5,000-25,000 Fine Forfeit All Catch Initiate 60-Day Permit Sanction	$10,000-25,000 Fine Forfeit All Catch Forfeit Vessel	
Simple <50 Fish	Forfeit Catch of Undersized Fish	Forfeit Catch of Undersized Fish $100-$250 Fine	Forfeit Catch of Undersized Fish $1,000-$2,000 Fine	
Processor				
Flagrant >50 Fish	$5,000-10,000	$10,000-15,000	$15,000-20,000	$20,000-25,000
Simple <50 Fish	Violation	Forfeit Catch of Undersized Fish $100-$250 Fine	Forfeit Catch of Undersized Fish $1,000-$2,500 Fine	
Exempted Fisheries Program:				
False Accounting and/or Failure to Account	$2,500-10,000 Fine Lose Eligibility for Exempted Fishing for 1 Calendar Year	$5,000-25,000 Fine Permanent Loss of Eligibility for Exempted Fishing		
Fishing Before Receipt of Permit	$100 Fine Violation	$500-1,000 Fine	Lose Eligibility for the Specific Exempted Fishery for 2 Years	
Not Meeting % Terms:[4/]				
Flagrant >5% Over Allowance	$5,000-25,000 Fine Lose Eligibility for the Specific Exempted Fishery for the Balance of the Year	$5,000-25,000 Fine Permanent Loss of Eligibility for Exempted Fishing		
Simple <5% Over Allowance	$1,000-2,500 Fine Violation	Follow Flagrant Schedule Beginning with First Offense		

1/ A five year limit should apply to the record of a penalty.
2/ Forfeiture of catch will require constructive seizure of a vessel.
3/ Use of a liner constitutes a flagrant violation of mesh.
4/ In addition to the fines, penalty equal to the monetary value of the overage may be sought.

Revised per Council discussion, May 21-23, 1985

ATTACHMENT 4

ADMINISTRATIVE LAW JUDGES AND PROCEEDINGS

Workshop on Fisheries Law Enforcement

University of Rhode Island

October 21-23, 1985

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Administrative Law Judges and Proceedings

I. Background on Administrative Law Judges

The power and responsibilities of Administrative Law Judges, or as they are more commonly known, ALJs, are defined in the enabling acts, procedural rules of various agencies, and the Administrative Procedure Act -- the 1946 statute designed to establish legal controls on agency discretion. A brief summary of the Administrative Procedure Act, or APA, is in order here. The modern era of administrative regulation began nearly a century ago with such regulatory agencies as the Interstate Commerce Commission and the Federal Trade Commission created to control the anticompetitive conduct of monopolies and powerful corporations. As we all know, since the 1940's, the number of agencies has mushroomed. As the economy and society itself changes and progresses at ever-increasing rates, so it seems have agencies proliferated to match society's growing concerns over various attendant issues. During the Depression of the 1930's and the New Deal, a multitude of agencies were created to stabilize the economy, such as the National Industrial Recovery Act, Fair Labor Standards Act and National Recovery Act, and provide some financial security for individuals, such as Social Security. In the 1940's and 1950's, still more agencies were established or given increased power to supervise and promote new technologies such as energy and air transport. The concern in the 1960's for social injustice and racial discrimination led to the creation of agencies to handle these matters. More recently,

there is a growing awareness that the very technologies agencies were created to promote are threatening the fabric of our environment. In response, we have created new agencies, such as the Environmental Protection Agency, to cope with these problems. As agencies have grown, so has there been a correlative increase in the numbers of ALJs: from 196 in 1947 to 1121 in 1984. See J. Lubbers, Federal Agency Adjudications: Trying to See the Forest and the Trees, 31 Federal Bar News and Journal 383 (1984).

Agencies have specialized staffs with expertise in limited areas, ability to evolve rules and policies under a general delegation of discretionary authority, can control entry into a field as in licensing requirements, set standards, adjudicate violations, and impose penalties. This demonstrates the flexibility inherent in the agency process and the ability to act quickly in the face of new situations and fashion a solution tailored to a specific problem. This same flexibility, however, carries potentially unchecked power. Combined with readily imaginable bureaucratic arbitrariness, insensitivity, and ineffectiveness, the interests of justice and fairness could be easily undermined. The APA was enacted as a corrective measure to balance agency flexibility with a limit on bureaucratic power.

The APA provides for some agency decisions to be made on a formal basis, with factual record-making before an official tribunal in a trial-type proceeding. The bulk of admininstrative decisions, however, are made informally. The APA imposes procedural requirements when an agency is engaged in future

substantive rulemaking (5 U.S.C § 553, the announcement of policy) or when established rules are applied to a particular individual fact situation in formal hearings which is referred to as adjudication. This is the ALJ's province -- when trial hearings are required in a case.

Most ALJ's are assigned to and employees of the agency that is charged with the enforcement and policymaking responsibilities of its distinct program. Before passage of the APA, ALJ's were known as hearing officers and generally were untrained, subordinate employees subject to the direction and control of the agency. In the 1930's, anxiety developed that the interest of fairness was not served when legislative (regulation promulgating), executive (license granting or withholding), and judicial (hearing a complaint against agency practice) powers were exercised by the same group of federal employees. In response to this, the APA adopted in 1946 included provisions that insure the independence of the ALJ. For example, performance and ratings of ALJ's are not conducted by the agency.

The principal function of the ALJ is to develop an accurate and complete record in particular cases after opportunity for a formal administrative hearing and to issue an initial or recommended decision based on the record. These decisions in most agencies are subject to review by the agency which, in turn, are subject to review by the district courts. Although courts have review authority, time and workload constraints limit a court's ability to thoroughly review each administrative proceeding. It is thus imperative that the ALJ render an

impartial and equitable decision and ensure that an accurate and complete record is developed. An administrative tribunal is also charged with conducting expeditious proceedings. Unlike federal courts, administrative proceedings were established to conduct the processes of government without the need for formalized lawsuits and rituals in order to expedite and simplify the decision-making process. However, as more respondents are employing lawyers to represent them in administrative proceedings, discovery requests are demanding more of the ALJ's time, and arguments, procedures, and the regulations themselves are becoming more sophisticated and complex, the records are becoming ever more burdensome and time-consuming. Thus, the responsibility for developing a complete, accurate record and rendering a fair, contemplative decision is coming into conflict with the ability of the agency to act quickly -- one of the prime strengths of the administrative system. The balance to be struck between the two needs to be explored.

II. ALJ's Function in the Department of Commerce and

In the Department of Commerce, the ALJ hears Patent and Trademark Office disbarment cases, International Trade Administration Anti-Boycott cases, and Equal Access to Justice Act attorney fees matters, as well as cases under a host of fish and wildlife statutes administered by the National Oceanic and Atmospheric Administration (NOAA). Recently, Congress passed the 1985 Amendments to the Export Administration Act which extend APA coverage to cases relating to compliance with controls on

sensitive exports to foreign nations, particularly the Soviet bloc. These cases, previously adjudicated on a more informal basis by a departmental hearing commissioner, are now to be adjudicated by an ALJ in the Department of Commerce. A new ALJ position has been authorized in our office, which will be responsible for managing the cases that arise under these amendments.

NOAA cases, at least up to this date, form the numerical bulk of the adjudications decided by this office. The pertinent statutes include the Magnuson Fishery Conservation and Management Act (16 U.S.C. § 1801-1882), Marine Mammal Protection Act of 1972 (16 U.S.C. § 1361-1407), Endangered Species Act of 1973 (16 U.S.C. § 1531-1543), Marine Protection, Research and Sanctuaries Act of 1972 (16 U.S.C. § 1431-1434), Northern Pacific Halibut Act (16 U.S.C. § 773-773j), Atlantic Tunas Convention Act of 1975 (16 U.S.C. § 971-971g), Tuna Conventions Act of 1950 (16 U.S.C. § 951-961), Lacey Act (16 U.S.C. § 3371-3378), Deep Seabed Hard Mineral Resources Act (30 U.S.C. § 1401, et seq.), Ocean Thermal Energy Conversion Act of 1980 (42 U.S.C. § 9101, et seq.), North Pacific Fisheries Act of 1954 (16 U.S.C. § 1021, et seq.), and Fur Seal Act of 1966 (16 U.S.C. § 1158, et seq.). Other than the Fur Seal Act, these statutes administered by NOAA authorize the administrator to assess a civil penalty for each violation against any person found to have committed an act prohibited by the statute or implementing regulations. The ALJ hears cases involving assessment of civil penalties -- not to be confused with criminal penalties -- as well as other proposed

permit sanctions and denials.

The NOAA procedural regulations, which are cited as example cases here, are set forth in the Code of Federal Regulations, Title 15, Part 904. After a violation is documented by an enforcement officer, a Notice of Violation and Assessment of Administrative Penalty (NOVA) is issued by the Regional General Counsel's office of NOAA to the person or persons alleged to have committed a violation, including a vessel owner and/or the operator, as the agency counsel determines appropriate. The NOVA contains a concise statement of facts, the act or regulations allegedly violated, the bases for the administrative decision to assess penalties, and the amount of the proposed penalty. When a respondent receives a NOVA, he may accept the proposed penalty, negotiate a compromise, seek to amend or modify the NOVA, request a hearing, or take no action. If no action is taken, the NOVA becomes effective as the final administrative decision and the respondent is liable for the penalty amount. When a respondent requests a hearing, our office becomes involved. Since only a small percentage of respondents request hearings, our office only sees the tip of the civil penalties iceberg.

Once a hearing is requested, the Regional NOAA Counsel promptly transmits the NOVA and request for hearing to our office. The case is then "docketed." That is, we file and log the case and assign an identifying number. Primarily, the docket is a list of cases arranged usually in chronological order from the date our office receives the request. The office keeps active and closed dockets which reflect the status of each case

and indicate the appropriate action taken or required. We also compile monthly case reports which indicate all the cases that are active, received and closed by decision, settlement, or dismissal. The graphs in the appendix demonstrate the spectacular increases from 1982 to 1985 in the number of active cases on our docket and the number of cases where respondents have requested hearings.

The ALJ has the authority and power to preside over parties and proceedings in accordance with the agency regulations and the APA. He rules on motions; schedules time, place, and manner of hearings and pre-hearing conferences; regulates the course of hearings; administers oaths and affirmations to witnesses; regulates discovery and receipt of evidence and exhibits; introduces into the record evidence on his own initiative; issues subpoenas; takes official notice, etc.

After a case is docketed, the office sends out a Notice and Order to all parties requesting them to submit a list of likely witnesses and issues in a Preliminary Position of Issues and Procedures. The Notice and Order also informs parties who we are, the form in which requested documents are to be submitted, timetables, and correspondence contacts. Unless an extension for time or other appropriate motion is requested and granted, if the office fails to receive the documents or the parties fail to file documents or respond to notices or orders from the ALJ, then the case is dismissed from our docket. This means the request for hearing is dismissed, not the case itself. The respondent is therefore still liable for the proposed penalty amount cited in

the NOVA. A party may, however, petition for review of the dismissal to the Administrator or petition the ALJ for reconsideration.

After the Preliminary Position on Issues and Procedures are submitted and other prehearing motions or actions such as depositions, interrogatories, production of documents, discovery, and subpoenas are completed, a Notice of Hearing containing information about the place and time of the hearing is sent to the parties. The ALJ has heard cases from Point Barrow, Alaska to Key West, Florida, and from Portland, Maine to San Diego, California -- anywhere NOAA's jurisdiction over the 200-mile Fisheries Conservation Zone or particular species may be heard. The factors usually considered in establishing a hearing location are the area where respondent lives, place of violation, and government counsels' requests. Hearings are generally held near the place of violation.

The hearing notice directs parties to appear at the hearing and informs them that the ALJ is not required to abide by the penalty amount proposed in the NOVA. Since the hearing is de novo, the ALJ is obliged to consider the totality of the matters in the record in arriving at his decision. The ALJ, however, does accord weight to the agency proposed penalty, since numerous factors considered at the administrative level determine the penalty amounts to be assigned to each type of violation.

Prior to the hearing, a telephone pre-hearing conference call is usually arranged wherein all parties have an opportunity to discuss the case, answer questions, resolve problems, and iron

out pre-hearing differences, incuding the nature of the hearing. Settlements and motions are frequently resolved at this time to be followed-up with a formal, written document reciting the resolution. Basically, the conference call facilitates the negotiating process. At the request of any party, the conference call can be recorded or conducted with a court reporter present.

Arrangements are made by the ALJ's office to provide a court reporter at the hearing as well as a hearing site. Although courthouses are the favored sites, if necessary, as in one case, the ALJ will hold a hearing in the back of a bar if that is all that is available. All NOAA hearings are open to the public.

At the hearing, the parties usually submit what they consider to be the relevant evidence, which the ALJ personally receives and carries back to the office. In some cases, where, for example, the exhibit is a fish which during its subsequent decay on a return trip home will empty an airplane of all fellow passengers or other such impracticable items, a photograph or appropriate alternative is substituted. Some of our exhibits are as esoteric as scrimshawed whale teeth. We also get our share of seal coats, clam shells, videotapes of a day in the life of a halibut fishing vessel, and slides of gouged coral from the marine sanctuaries off the Florida coast. Occasionally, demonstrations are provided and the ALJ and parties have left the courtroom to witness the operation of Loran-C and radar equipment. All exhibits are part of the record.

Witnesses testify at the hearing, evidence is offered, parties are examined and cross-examined, and the ALJ himself may

engage in limited examination of witnesses if this will serve the best interests of creating an accurate and complete record. Although the formal rules of evidence serve as a guide, they are not necessarily applicable to these administrative proceedings. At any time during the whole process, a question may be certified for review by the administrator. Up to the time of the decision itself, parties may settle the case. Since so much time and effort is required in preparation for a hearing, it would be more efficient to settle cases prior to hearing preparation. Although a 10-day prehearing settlement rule has been invoked, that is settlement may occur up to 10 days before the hearing or the settlement offer is withdrawn, it has not been uniformly applied, occasionally resulting in needless travel and hearing arrangements.

After the hearing, transcripts are received by this office in about 20 days, copies of which are sent to each party. An Order is concurrently issued scheduling dates for filing post hearing briefs, replies, and closing the record. At the end of all this activity, the ALJ renders a written initial decision. He reviews witness demeanor and testimony, gravity and circumstances of the violation, presence or absence of prior enforcement proceedings against respondents, and ability to pay: the totality of the circumstances. All these factors are considered in arriving at the conclusion, findings of facts, and assessment of a civil penalty, if any, in the initial decision. The ALJ may also recommend other sanctions such as revocation, denial, or suspension of permits.

An issue that often arises is the ability of the ALJ to review the constitutionality of the statute or regulations. Under the regulations, the ALJ may not rule on the constitutionality or facial validity of the regulations or statutes. Moreover, constitutional questions are the territorial imperative of the judiciary. Constitutional questions, however, may be raised at the hearing to be preserved in the record for review. Although the ALJ may not consider the constitutionality of the regulations themselves, he has a duty to apply constitutional principles to the individual fact situations before him, such as fourth amendment issues of search and seizure and the fifth amendment right against self-incrimination.

Within 30 days of the initial decision, a party may petition the administrator for review of the decision. Review, however, is not a matter of right but rests on the discretion of the administrator. The grounds for a petition for review are as follows:

(1) A finding of a material fact is clearly erroneous based upon the evidence in the record;
(2) A necessary legal conclusion is contrary to law or precedent;
(3) A substantial and important question of law, policy, or discretion is involved; or
(4) A prejudicial procedural error has occurred.

15 C.F.R. 904.272(c). No new matters of fact or law can be raised on review nor is oral argument customarily permitted. This is one of the reasons the ALJ is responsible for developing an accurate and complete record. If the administrator declines to exercise discretionary review, the decision usually specifies the date upon which the ALJ's initial decision becomes effective as the final agency decision. If the administrator does review the record, he issues a final order with or without further proceedings. Once a decision becomes the final agency action, the parties may petition the federal district courts for review. The administrative decisions in NOAA cases have been published and can be found in the Ocean Resources and Wildlife Reporter. These decisions will soon be on Lexis, the computerized legal research system, as well.

III. Some Personal Observations

The whole administrative appeal process is fraught with conflict. Although the APA provided in part for a separation of adjudicatory from investigative and prosecutorial personnel within federal agencies, the prosecutorial and appellate review functions within the Department of Commerce are, for all intents and purposes, the responsibilities of NOAA general counsel, although these functions may be carried out by different personnel within that office. It appears that the NOAA administrator has delegated substantial authority to NOAA general counsel to prepare final decisions when an adverse result is appealed. Although Congress had in mind the fusion of the

appellate review functions at the highest level of authority within the department -- that is the agency itself -- in fact, the person who prepares the final administrative decision and exercises the quasi-judicial power in the name of the administrator is appointed by NOAA general counsel who is responsible for the prosecution of the administrative hearing which ultimately resulted in that decision. This creates the appearance of a fusion of functions at all levels of the adjudicatory process. The above described colocation of functions also appears to invite increased danger of ex parte communications at the appellate level. See the January 30, 1970, Order of Secretary Hickel, Department of Interior which created the Office of Hearings and Appeals for that Department. Although there are fundamental differences between administrative review and the judicial appellate functions, to ensure decision credibility the reality or appearance of unfairness must be eliminated. See Public Land Law Review Commission's Report of 1970, at 253 and Boards of Appeal within the Office of Hearings and Appeals, Department of the Interior, March 4, 1977 for an informative analysis of this issue.

Once a decision becomes the final agency action, any party may petition to federal court for review. Although we have been informed that a number of decisions have been appealed to federal courts, few appear to have been granted judicial review resulting in any published decision. Since 1982, we have been advised that there have been approximately 27 civil penalty review cases that have been or are presently being considered by the federal

courts. Our experience has been that the agency record and decision is usually upheld. In 1982, a district court for the first time reviewed a NOAA civil penalty decision in a case concerning the Endangered Species Act and Lacey Act. See Newell v. Baldrige, W.D.Wash. Civ. No. C81-133R (1982). The court there found that the $23,000 assessed by the agency (reduced from $90,000 assessed by the ALJ) was entirely justified. Under the various acts the courts have the power to review the violations and assessment of civil penalties de novo. The court in Newell found that since there was no uncertainty about the facts in the record and the parties had full opportunity to present their cases in the administrative proceeding, the court, in its de novo review, limited itself to the record made at the administrative level. Usually that is the court's approach, though in some cases a new evidentiary hearing is held.

In several other cases that have been reviewed by the district courts, the courts have found substantial evidence in the record to support the agency's finding. See Britton v. NOAA, D. Mass. Civ. No. 84-0111T; Lovgren v. Byrne, D.N.J. Civ. No. 84-2436 (1985); Lopes and Lady Grace Corp. v. NOAA, D.Mass. Civ. No. 2695-S (1985). In the Lopes case, although the court upheld the ALJ's decision, it remanded the case for reconsideration of the ability to pay. The maximum fine had been assessed based on prior misconduct. The regulations require respondents to demonstrate inability to pay by providing a complete and accurate financial statement to the administrator and must submit the relevant requested financial information. If respondents want

ability to pay to be considered in the ALJ's initial decision, the information to be presented to the ALJ must be submitted to NOAA general counsel 10 days in advance of the hearing. In Lopes, this procedure was not followed nor was sufficient information submitted to the ALJ to make an informed decision on ability to pay. Since the case has been settled, the remand has been nullified.

Presently, the majority of the cases on appeal represent the "Brownsville Lacey Act shrimp cases." In 1982, Lacey Act cases constituted less than 1 percent of the cases received on our docket. That figure is now close to 41 percent. As new parts of the fisheries industry are regulated, enforcement policies are changed or redirected, or new regulations are promulgated, the regulations challenged fluctuate, as reflected in our docket. When the tuna/porpoise regulations under the Marine Mammal Protection Act were adopted and enforced, 95 fishermen requested hearings. Lately, we have seen an increase in clam processors, Marine Protection, Research, and Sanctuaries Act, and Lacey Act cases. The Brownsville Lacey Act cases involve the fishermen in and around Brownsville, Texas who fish for shrimp in Mexican waters in violation of Mexican law. Bringing the Mexican shrimp back to the United States constitutes the charged violation. In general, the importation of fish or wildlife in violation of another nation's laws violates the Lacey Act. Thirty-five of these cases were heard in the summer of 1984 and 153 are being heard this month in Texas. It now appears, however, that most of

these are settling. Several interesting issues have been raised in these cases including the establishment and location of Mexico's Exclusive Economic Zone, United States recognition of the Mexican Exclusive Economic Zone, and interpretation of Mexican law.

It is worth noting that, as the Brownsville cases demonstrate, where groups of cases require determination of discrete factual situations, such as accuracy of Loran-C, radar, and navigational charts, once the determination is established, these facts do not need to be relitigated in every case. In particular, the accuracy of the Loran-C navigational and positioning system seems to be a regularly contested issue; however, if appropriate procedures are followed and the Loran-C is properly checked and used, the Loran-C is an accurate device for determining location. In fact, a district court has recently upheld this issue after reviewing one of our civil penalty cases. See Lopes and Lady Grace Corp., supra.

In all these cases, although there is an initial recalcitrance or resentment or just attempts to test the authority of the regulations, most fishermen and others in the industry eventually adjust to the reality that theirs is a regulated industry and, if they violate the regulations, they may be liable for a civil penalty as well as other sanctions. In fact, illegal behavior in discrete fisheries has dwindled markedly over time.

Compliance, however, is slower to take effect in non-commercial, non-discrete sectors. The Marine Protection,

Research, and Sanctuaries Act cases are paradigmatic. These cases usually arise when pleasure boats, tankers, or freighters sail too near the Florida coral reefs. Over the last year, the number of coral reef groundings has multiplied, resulting in serious, long-term damage to the protected coral reefs. Last year a 400-foot freighter, in a seeming attempt to build a new canal from the Atlantic Ocean to the Gulf of Mexico, rammed Molasses Reef, part of the only living coral reef in continental waters, totally destroying large areas equal to about three football fields of the slow growing formations.

Many pleasure cruise vessels contain few or no navigational aids, are frequently unseaworthy, and are captained by inexperienced personnel. Notice further compounds the difficulty. Those in the affected, widespread industries, in addition to notice in the Federal Register, belong to associations which provide notice and comment regarding the regulations and have immediate and easy access to various newsletters, press releases, and meetings. Although publication in the Federal Register constitutes sufficient notice, the individual pleasure cruiser or scuba diver is unlikely to be aware of the regulations.

Although compliance may be grudging, it is nevertheless on the rise, in some part due to the administrative proceedings. Usually the deterrent effect is manifest in two stages. The first impact is felt when the penalty in particular cases is first announced through publication and those in the industry learn of it. The effect is then apt to diminish until, at the

federal court level, collection is imposed. Compared with other administrative proceedings such as those under the Export Administration Act and Mine Safety Act, NOAA experiences only half the delay in the process between the date of violation and final collection. Nonetheless, even this time gap should be narrowed. The total proceedings indeed have a salutory effect on deterrence, but the impact on affected industries is keener when resolution of the process follows quickly upon the heels of the violation itself. Moreover, the timeliness of administrative proceedings has become a pertinent issue with the recent Fifth Circuit Court of Appeals decision in United States v. Core Laboratories, Inc., 759 F.2d 480 (5th Cir. 1985). Although an Export Administration Act case, the decision dealt with the statute of limitations applicable to administrative proceedings. The identical issue was treated in two NOAA cases as well. At the administrative level, the ALJ found that the 5-year statute of limitation period runs from the commission of the act giving rise to the liability, not from the time of imposition of administative penalty. The statute is thus tolled not by administrative proceedings but by filing in distict court. The Agency reversed the ALJ's finding, but on appeal to U.S. District Court, the ALJ's interpretation of the Statute of Limitations was upheld. The District Court decision was appealed, and the Fifth Circuit upheld the district court's decision. The Solicitor General has declined to request review by the Supreme Court despite urging by a dozen or so agencies. This case should be a signal to agencies that the processing of cases must be

accelerated.

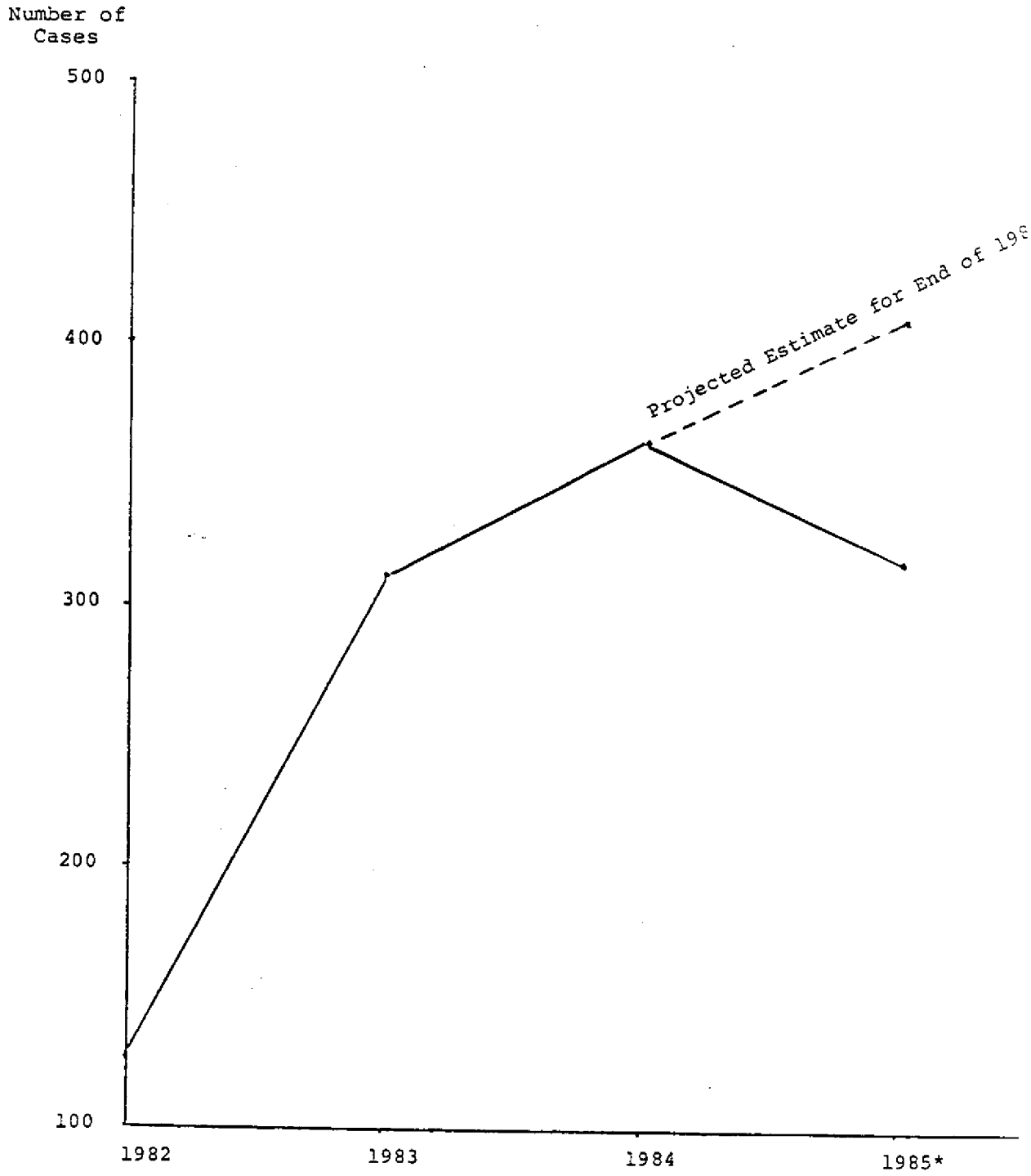
Another problem with enforcement occurs when at the conclusion of the proceedings, the penalties are either not collected or are virtually waived. This was evident in the tuna/porpoise cases. Under the Marine Mammal Protection Act, tuna fishermen are required to use specified measures and equipment to eliminate or reduce the take of porpoise in purse seine operations. Numerous violations were cited and although hearings were held, a variety of federal court proceedings intervened to suspend administrative action. The fishermen's complaints were denied at both the district and circuit court levels, whereupon, years later, the cases were ripe for collection. Although several decisions were rendered, the Government settled the majority, usually for no more than nominal amounts, pennies on the dollar. What does this convey to other segments of the industry? Only that while violations may be cited and the administrative process will move into operation, the regulations will have no impact nor will the agency commit itself to the forceful implementation of the directives issued under the statute or regulations.

IV. The Status of ALJ's

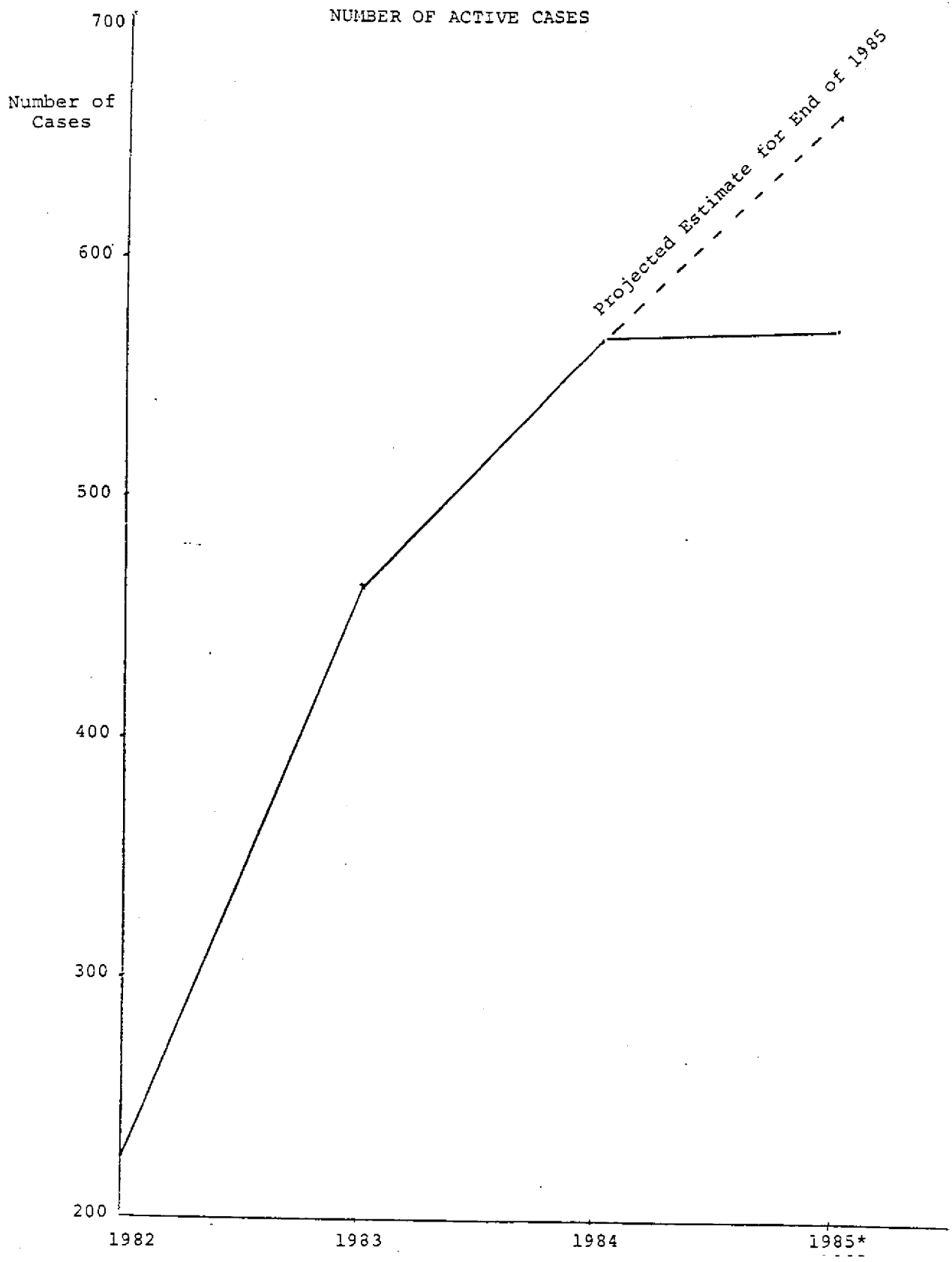
Although the APA itself has remained relatively unchanged since 1946, there are now 5 times as many ALJ's to meet the increasing demand for administrative proceedings. The majority of the ALJ's are in the Social Security Administration. Since 1978, the Department of Commerce has seen a large percentage rise

in fishery civil penalty cases. In today's Federal Government, the ALJ has become "less an organizer and initial decider of regulatory policy issues and more the (often final) dispenser disability benefits or arbiter of civil money penalties -- cases where factfinding, demeanor evidence, fairness and speed are hallmarks, and policy issues absent or submerged." J. Lubbers, supra, at 385. The shift in functions is fueling the revival of proposals to separate adjudictors from the rest of the agency. This trend is supported by the Federal Administrative Law Judges professional organizations. Removed from the appearance of supervision and control of the agencies where they are currently employed, ALJ's would be transformed into an independent, unified corps. Most proposals would retain the agency's ability to review the ALJ's initial decision. Moreover, it is argued that such a corps could be more efficient and less costly as well as promote perceived or real fairness, unbias, and decisional independence.

NUMBER OF CASES RECEIVED



*Through Sept. 1985


NUMBER OF ACTIVE CASES
Number of Cases
700
600
500
400
300
200
Projected Estimate for End of 1985
1982
1983
1984
1985*

EVALUATING ENFORCEMENT EFFECTIVENESS

Workshop on Fisheries Law Enforcement

University of Rhode Island

October 21-23, 1985

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EVALUATING ENFORCEMENT EFFECTIVENESS

LT Thomas A. Nies, USCG*

The Coast Guard's formal fisheries law enforcement program has been in place for at least twenty five years. Over that period the Coast Guard has obtained extensive experience in conducting at sea boardings, a large inventory of hardware to use for enforcement, and personnel familiar with enforcement procedures. The one item that has eluded the Coast Guard so far is an effective measure of the quality of enforcement; that is, just how well are they doing?

The Coast Guard spent $101 million in direct operating costs in fiscal year 1984 on fisheries law enforcement. If this large outlay of funds is to be justified, it should be clear just how much enforcement is being bought. How much enforcement is enough is a management decision that should be made by the managers. The draft of each management plan should include a detailed statement (hours and dollars) on how much at-sea and shore side enforcement is desired to achieve the goals of the plan. After the plan is implemented, the goals of the plan should be monitored and the effect of enforcement on achieving those goals should be determined. Added or reduced enforcement effort could then be planned by the enforcement agencies.

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The views presented in this paper are attributable onnly to the author and do not necessarily represent the views of the Department of Transportation or the United States Coast Guard.

Currently, fishery management plans do not specify a desired enforcement level. They do attempt to estimate the costs of enforcement within the regulatory impact analysis, primarily to demonstrate the cost effectiveness of the plan. This dollar estimate is rarely accompanied with the numerical number of patrol hours, boardings, etc., that are desired. It is not updated frequently, with the result that cost estimates are unrealistic (thanks to inflation and a need to demonstrate cost effectiveness, usually unrealistically low) and are based on conditions in the fishery when the plan is drafted.

This discussion assumes that there is a direct, verifiable connection between enforcement levels and the achievement of management goals. Optimum yield is usually the long term goal of any fishery. While the precise definition of optimum yield is subject to debate, it would be ideal if we could link the attainment of optimum yield to each of our management controls. For example, if we double our enforcement effort, can optimum yield be attained in three years rather than four? The problems are whether optimum yield can be defined precisely, and whether management elements can be monitored closely enough to establish links between the two. Throw in the hundreds of outside elements that influence optimum yield - weather, external economic conditions, El Nino, to name a few - and it is doubtful whether the relatively small - but important - effect of enforcement can be monitored closely enough to be of use.

In 1980, the Coast Guard contracted for a study to develop a model to link enforcement effort levels with the percentage deviation in attaining the optimum yield (optimum yield was defined solely in biolgical terms).

Ideally, the Fishery Law Enforcement Program Model II (FLEPM II) would have provided a model that would have allowed the testing of different resource levels and enforcement strategies, so as to allow the manager to pick the most effective enforcement program for a given dollar value. Different resource mixes could have been tested. The results were inconclusive. While the report provided an extensive and thorough theoretical discussion of the issue, it did not provide a useful management tool. The authors of FLEPM II made a concerted effort to avoid the use of "crime rate" information (boardings, violations, etc.) as an effectiveness measure. Unfortunately, much of the data required to measure cost effectiveness was not available and the study did not assess the effect of observers and shoreside enforcement.

As a result of this failure to devise an effectiveness measure, the Coast Guard has been forced to collect data and record actual results, as opposed to being out in front of the problem based on statistically valid projections and correspondingly valid management decisions. Boardings, cutter employment hours, resource hours, violations, sightings, vessels present, days on ground, etc. - all are counted but are not linked to effectiveness. This data collection is necessary for resource justification; it is not used for fisheries management. The numbers are used in the annual budget battles; as a result, more violations, more boardings, more patrol hours, etc., result in the award of more resources with which to enforce fishery management plans during fiscal boom years, or at least prevent reductions in the level of resources currently dedicated to fisheries enforcement in down fiscal years.

All of this has been based on one key assumption: that the Coast Guard's enforcement effort level has been and continues to be too low. Given this

assumption, sophisticated enforcement needs studies and projections are dismissed as unnecessary because it is assumed that any additional enforcement effort will produce correspondingly "better" enforcement (more violations). In other words, we are so far down on the power curve that the risk of achieving a diminishing return for a marginal resource increase is not even considered. This assumption is partially supported by the political outcry when enforcement is decreased because of budget cuts, as well as comments of some fishermen that the plans are not working because of a lack of enforcement. Further evidence came from the discovery of widespread catch underlogging by the Japanese trawler fleets in Alaska. In Alaska, the Coast Guard has tried to keep at least two cutters on patrol at all times. This patrol effort, far below the 1100 cutter days believed necessary when the MFCMA became law, allowed the underlogging to escape detection for several years. Even now, with foreign fishing considerably reduced in Alaska and one of the highest boarding rates we have seen in that region, the Coast Guard has obtained some information that indicates serious underlogging may continue, even on vessels with observers.

Data management is primarily accomplished through the Enforcement Management Information System (EMIS), a computerized data base jointly managed by the National Marine Fisheries Service and the Coast Guard. Data on sightings, boardings, violations and written warnings issued are maintained on a regional basis. The foreign fleet effort is monitored both by number of vessels present and the number of days spent on the fishing grounds. Domestic fishing effort is monitored only by the number of vessels issued permits, because of a lack of check in and check out requirements. Violation tracking through the civil penalty process is also maintained in an access restricted data base.

Coast Guard fisheries patrol effort is monitored through the abstract of operations reports. Each operating unit is required to report the number of hours spent on each of twenty-four specific missions. Fisheries enforcement is reported separately for domestic and foreign fisheries laws, but there is no distinction made between Magnuson Act and non- Magnuson Act enforcement. There are two types of hours: resource and employment hours. A resource hour is assigned to the principal mission the cutter is performing at any given time. Employment hours are an attempt to describe the multi-mission character of the Coast Guard. While a cutter can only report twenty four resource hours in each day, employment hours can exceed twenty four hours because a unit can assign a given hour to different missions.

The abstract of operations report has many limitations. Historically, the report did not track where the resource hours were spent. Hours are not reported by geographic area, and the Coast Guard cannot precisely track how many hours are spent in a given fishery. If a boarding is conducted on a vessel participating in more than one fishery plan (for example, a trawler catching groundfish and an incidental lobster catch), it is impossible to accurately assign the benefit of the boarding to each management plan. Recent improvements to the abstract, as well as the implementation of a new Summary Enforcement Event Reporting System, will allow better tracking of our enforcement effort in the future. Attached are some samples of the information that can be obtained from the EMIS and abstract of operations systems (Figures 1-4).

Until 1982, the Coast Guard was required to submit to Congress a semi-annual (initially, annual) report on enforcement. This report was primarily a recital of data with a qualitative analysis of its significance. This report was discontinued when the statutory requirement for it was removed. While of limited use in evaluating effectiveness, the report did force a rigorous review of enforcement statistics.

Evaluating effectiveness is thus a problem of combining all available data into a useable measure. The result may not be an empirical answer, such as per-centage deviation from the optimum yield. It may be necessary to resort to a relative measure, one that would be able to track changes in effectiveness. This is based on a belief that the detection of violations will follow some sort of curve; that is, with no enforcement, no violations will be detected, but as enforcement increases, at some point the detection rate should begin to decrease (Figure 5). The difficulty with this simple model is that it ignores other influences on the detection rate that may be stronger influences than enforcement effort.

Any measure of enforcement effectiveness should have a few basic characteristics. First, it should use data currently available without the introduction of additional reporting requirements or data collection efforts. It should consider the effect of all types of enforcement on achieving a recognizable goal; the contribution of both types o f enforcement (shoreside and at-sea) should also be capable of being analyzed separately. The measure should be easily used, by incorporating it into a user friendly software package. Finally, it should provide a reliable estimate for testing proposed enforcement schemes and the addition of new fishery management plans.

Enforcement is a key element to any fisheries management plan. Until we develop a method to measure its effectiveness, management of fisheries resources is nothing more than guesswork. There are currently two studies of the fishery management system that should help clarify the problem of enforcement effectiveness. The NMFS should issue a contract in the near future for a study of the entire fishery management process. The General Accounting Office (GAO) has already initiated a study on several fishereis management issues, including the costs of enforcement. When completed, these two studies should significantly impove our understanding of the enforcement process and help to design better enforcement systems.

APPENDIX C

COMPARISON OF FOREIGN FISHING VESSEL ACTIVITY

1/01/1978 TO 12/31/1978, 1/01/1983 TO 12/31/1983, 1/01/1984 TO 12/31/1984

MONTH	1978	1983	1984	% CHANGE 1983 VS 1978	% CHANGE 1984 VS 1983	% CHANGE 1984 VS 1978
JANUARY	158.	193.	126.	22.15	-34.72	-20.25
FEBRUARY	248.	221.	209.	-10.89	-5.43	-15.73
MARCH	223.	214.	142.	-4.04	-33.64	-36.32
APRIL	337.	188.	95.	-44.21	-49.47	-71.81
MAY	413.	258.	96.	-37.53	-62.79	-76.76
JUNE	573.	336.	278.	-41.36	-17.26	-51.48
JULY	517.	284.	288.	-45.07	1.41	-44.29
AUGUST	239.	296.	327.	23.85	10.47	36.82
SEPTEMBER	311.	333.	322.	7.07	-3.30	3.54
OCTOBER	311.	297.	301.	-4.50	1.35	-3.22
NOVEMBER	281.	224.	222.	-20.28	-.89	-21.00
DECEMBER	258.	178.	158.	-31.01	-11.24	-38.76
AVERAGE	322.	252.	214.	-21.89	-15.16	-33.73

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APPENDIX F
FOREIGN FISHING VESSEL (FFV)
BOARDING AND VIOLATION PROFILE
October 1, 1983 TO September 30, 1984

MONTH BEGINNING	FFV PRESENT	NO. FFV BOARDED	% FFV BOARDED	CUTTER EFFORT CITS/ NOVAS	CUTTER EFFORT NO. FFV W/VIO	CUTTER EFFORT % FFV W/VIO	OTHER CG EFFORT CITS/ NOVAS	OTHER CG EFFORT NO. FFV W/VIO	OTHER CG EFFORT % FFV W/VIO	OVERALL EFFORT CITS/ NOVAS	OVERALL EFFORT NO. FFV W/VIO	OVERALL EFFORT % FFV W/VIO
10/01/1983	297.	16.	5.387	10.	2.	12.500	3.	3.	1.010	13.	5.	1.684
11/01/1983	224.	36.	16.071	13.	11.	30.556	6.	6.	2.679	19.	17.	7.589
12/01/1983	178.	21.	11.798	14.	9.	42.857	3.	3.	1.685	17.	12.	6.742
1/01/1984	126.	35.	27.778	8.	4.	11.429	7.	7.	5.556	15.	11.	8.730
2/01/1984	209.	24.	11.483	10.	4.	16.667	5.	3.	1.435	13.	9.	4.306
3/01/1984	142.	26.	18.310	8.	7.	26.923	11.	11.	7.746	19.	18.	12.676
4/01/1984	95.	39.	41.053	5.	5.	12.821	2.	2.	2.105	7.	7.	7.368
5/01/1984	96.	30.	31.250	5.	4.	13.333	0.	0.	.000	5.	4.	4.167
6/01/1984	278.	101.	36.331	8.	6.	5.941	13.	9.	3.237	21.	15.	5.396
7/01/1984	288.	93.	32.292	7.	7.	7.527	14.	12.	4.167	21.	19.	6.597
8/01/1984	327.	69.	21.101	10.	6.	8.696	16.	15.	4.587	26.	21.	6.422
9/01/1984	322.	65.	20.186	7.	7.	10.769	11.	10.	3.106	18.	17.	5.280
GRAND TOTAL	2582.	555.	21.495	105.	72.	12.973	91.	81.	3.137	194.	155.	6.003

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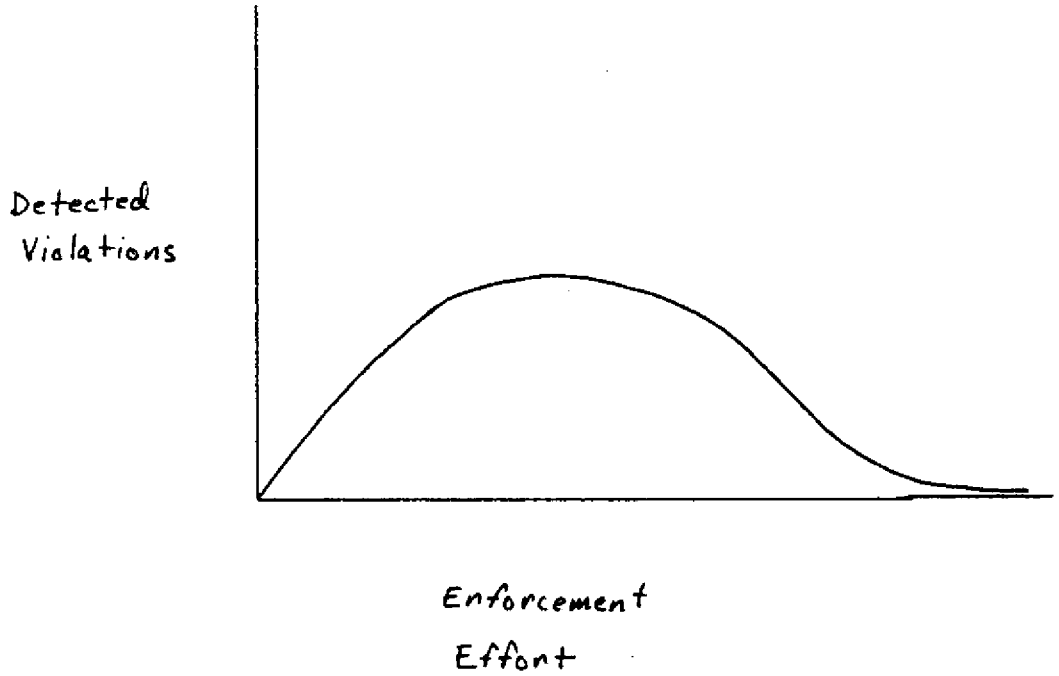
APPENDIX G
DOMESTIC FISHING VESSEL (DFV)
BOARDING AND VIOLATION PROFILE
October 1, 1983 TO September 30, 1984

MONTH BEGINNING	NO. DFV BOARDINGS	NO. DFV BOARDED	% DFV BOARDED	CUTTER EFFORT CITS/ NOVAS	CUTTER EFFORT NO. DFV W/VIO	CUTTER EFFORT % DFV W/VIO	OTHER CG EFFORT CITS/ NOVAS	OTHER CG EFFORT NO. DFV W/VIO	OTHER CG EFFORT % DFV W/VIO	OVERALL EFFORT CITS/ NOVAS	OVERALL EFFORT NO. DFV W/VIO	OVERALL EFFORT % DFV W/VIO
10/01/1983	180.	170.		13.	11.	6.471	0.	0.		13.	11.	6.471
11/01/1983	157.	148.		7.	6.	4.054	2.	2.		9.	8.	5.405
12/01/1983	187.	178.		9.	9.	5.056	1.	1.		10.	10.	5.618
1/01/1984	180.	171.		21.	14.	8.187	0.	0.		21.	14.	8.187
2/01/1984	109.	105.		12.	8.	7.619	1.	1.		13.	9.	8.571
3/01/1984	211.	200.		14.	8.	4.000	3.	3.		17.	11.	5.500
4/01/1984	272.	236.		27.	12.	5.085	4.	4.		31.	16.	6.780
5/01/1984	395.	367.		50.	39.	10.627	1.	1.		51.	40.	10.899
6/01/1984	403.	348.		43.	28.	8.046	2.	2.		45.	30.	8.621
7/01/1984	222.	221.		18.	15.	6.787	13.	8.		31.	20.	9.050
8/01/1984	210.	202.		27.	15.	7.426	5.	5.		32.	20.	9.901
9/01/1984	150.	148.		9.	7.	4.730	2.	2.		11.	9.	6.081
	2676.	2494.		250.	172.	6.897	34.	29.		284.	198.	

^L*


Detected
Violations
Enforcement
Effort

ENFORCEMENT COSTS IN FISHERIES MANAGEMENT: THE ALTERNATIVES

by

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Abstract

Enforcement Costs in Fisheries Management:

The Alternatives

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Enforcement costs under the fishery management plan process are important considerations. The success of fishery management regimes depends upon the enforceability of implementing regulations and the cost effectiveness of the enforcement effort. Frequently, enforcement comprises the most costly aspect of implementing a fishery management plan. However, without adequate enforcement, the plan may fail. Alternative approaches to fisheries law enforcement are explored with priority consideration given to those methods which promote efficiency at minimal costs.

Introduction

Enforcement costs under the fishery management plan process are important. Successful management of our nation's fishery resources depends upon the enforceability of implementing regulations and the cost effectiveness of our enforcement effort. Frequently, enforcement comprises the most costly aspect of implementing a fishery management plan (FMP). However, without adequate enforcement of critical regulations, the plan may fail.

Background

When Congress passed the Magnuson Fishery Conservation and Management Act (MFCMA) in 1976 it clearly explained prohibited acts, established appropriate civil and criminal penalties, described enforcement responsibilities, and defined the powers of authorized officers. Congress delegated the task of promulgating regulations to the Secretary of Commerce. The Secretary of Commerce and Secretary of Transportation (U.S. Coast Guard) share responsibility for enforcing the provisions of the MFCMA.

Seven years of FMP enforcement has taught us that often enforcement comprises the most costly aspect of implementing a plan and is critical to attaining its objectives. Regulations controlling important conservation management measures must receive adequate amounts of enforcement.

Decisions involving assignments of enforcement resources are enhanced by our understanding of:

a) compliance, and what constitutes a reasonable level thereof;
b) the enforcement modes available to meet selected regulatory requirements;
c) the relative costs of the enforcement modes;
d) their effectiveness; and

e) the strategies employed once appropriate modes are established.

Discussion

Program effectiveness in fisheries law enforcement is usually assessed by the phrase "reasonable level of compliance." This phrase generaly means that violations in a fishery under regulation are occurring at a rate which:

a) is much lower than that at which they would occur with no enforcement;
b) is acceptable to the industry and the public; and
c) contributes to the conservation goals established by the FMPs.

Reasonable level of compliance is a relative term. Measurements, if possible, would focus on the number of violations that might occur in the absence of any enforcement less the number of unsuppressed violations given the enforcement effort. Such measurements often vary significantly from one fishery to another. They are affected by different input levels of fiscal and human resources, the modes chosen, and ultimately by the effectiveness of the enforcement effort itself.

Enforcement modes exist in two general categories; dock-side, and at-sea. The at-sea modes include observers, ship and boat patrols from which boardings and sightings are made, and aircraft patrol, both fixed wing and helicopter. The dock-side modes include monitoring landings, inspecting dealers, processors, and shipping conveyances, and conducting covert and overt investigations.

With the exception of the observer mode, which is strictly a NMFS program, these enforcement modes are conducted by personnel and facilities of

NMFS, the Coast Guard, and state conservation agencies that have entered into cooperative enforcement agreements with the Federal agencies. Coast Guard efforts are predominately at-sea, while NMFS and State efforts are predominately dock-side. Small patrol boats, owned by NMFS or the States and used for enforcement predominately between 0 and 12 miles, have become increasingly important. Similarly, air patrols in state-owned planes and aircraft chartered by NMFS are invaluable for domestic fishery enforcement.

Observers provide continuous monitoring of a fishing vessel's activities. They cannot observe operations 24 hours each day, but their presence on board provides the potential for monitoring any activity. Often, observers detect violations committed outside their presence later during processing, storage or recordkeeping accountability operations.

Observers play an important role in foreign fisheries law enforcement. Congressional mandates now require 100% observer coverage for the foreign fleet. The associated costs are borne by the foreign governments. Table 1 illustrates the effectiveness of observers in monitoring compliance. Many of the measures listed in this table are contained in the foreign fishing regulations.

Ship and boat patrols provide the platforms from which boardings are made. They also provide an all-weather capability for searching small areas and determining detailed information on the types, numbers, identities, activities, positions, and gear of fishing vessels. Ships are distinguished from boats because they are larger, they generally patrol further offshore, they can sail in any type of weather, and they can stay on-scene for longer periods of time.

A boarding, as seen in Table 1, is a very effective compliance monitoring technique. It provides detailed information on catch, gear, processing and

hold capacities, and compliance with data collection and reporting requirements.

Ship and boat patrols provide support for the observer program and platforms for boarding. They are effective compliance monitoring mechanisms. However, Tables 2 and 3 indicate that they are by far the most costly elements of the enforcement program.

The daily rates shown for high endurance cutters, medium endurance cutters and patrol boats in Table 2, lines A(1)-(3) reflect current standard hourly rates charged by the U.S. Coast Guard multiplied by 24. Patrol boats are included with the big cutters because they can provide 24-hour coverage when needed. The amounts shown reflect a total dedication to fisheries law enforcement. In reality, all Coast Guard at-sea patrols are multimission and the time devoted to fisheries enforcement varies significantly from one patrol to another.

The boarding cost data presented in Table 2 was derived by dividing the number of boardings into the daily rate for the platform from which the boarding is made. Generally, a high endurance cutter makes fewer boardings per day than a small patrol boat. For example, a high endurance cutter in the Bering Sea off Alaska, totally dedicated to fisheries law enforcement, may spend five days looking for a vessel to board and then need 2 full days to complete an accurate inventory. In this case, the boarding rate would be $51,664 x 7 or $361,648. On the other hand, relatively small fishing areas off the east coast's mid-Atlantic states often find foreign vessels concentrated so heavily that 4 or more boardings a day are common.

Small NMFS or state-owned boats usually patrol close to shore and boardings, if large concentrations of domestic fishing vessels are found, may number from 8 to 12 per day. The boat patrols are conducted by vessels

normally ranging from 6 meter outboards to inboard cabin boats exceeding 15 meters. Weather limits their operations as does their inability to perform effectively for more than 8 hours without returning to shore for fuel and supplies. Therefore, the costs shown in Table 2A.4 are based on an 8-hour day.

Aircraft patrols have limited applications as seen in Table 1. However, they are the best modes available for monitoring compliance with closures. They are particularly well-suited for searching large areas to determine the presence, type, number, identity, and activity of vessels. Table 2 shows estimated cost figures for various types of aircraft.

As seen thus far, the at-sea enforcement modes are also the most expensive. Any management measure or regulation that succeeds in moving enforcement from the sea to the shore will reduce costs and improve efficiency.

Dock-side enforcement ranges from the general patrol to verify a vessel's presence in, or absence from, port to monitoring landings to ascertain the results of fishing efforts to lengthy, complex investigations.

The most common dock-side effort involves monitoring landings to determine compliance with management measures such as quotas, size limits, possession prohibitions, gear restrictions, permit requirements and recordkeeping requirements. This is an excellent mode for the domestic fishing industry because separating species and conducting accurate inventories is always accomplished at the point of offloading. More information about the results of fishing efforts can be obtained from observing an offloading than can be made during a boarding at sea. Normally, dock-side enforcement is best suited for domestic fisheries. However, when a boarding party suspects that a foreign vessel has been underreporting its

catch, the best way to confirm those suspicions is to bring the foreign vessel into a U.S. port and inventory its catch.

Costs for dock-side enforcement efforts are small compared to the high costs of at-sea enforcement. The $227 per day figure used in Table 2 results from the following rationale:

a) the average annual salary of a NMFSs agent after allowing for overhead, travel, overtime, premium pay, and equipment is $50,000; and

b) the $50,000 annual salary is divided by 220 because this is the average number of days worked by an agent during a one-year period.

The vessel inspection figures illustrated in Table 2 are the daily rates of $227 divided by sample numbers of landings an enforcement agent can monitor per day. Many factors affect the rate of landings which may be monitored in a day. They include:

a) the vessel population;

b) the number of fisheries under regulation;

c) the frequency of landings;

d) the method of offloading; e.g., from beach to shipping conveyance, dock to shipping conveyance, vessel to processing plant, etc.;)

e) the distance between ports;

f) the number of offloading areas; and

g) the time required to offload.

Dealer and processor inspections can usually be accomplished while monitoring landings. Many of the same factors affecting the monitoring of landings also affect the number of dealer/processor inspections that can be

accomplished in a single day. That number depends on concentration of dealers, volume of fish stored or processed, and degree of difficulty involved when tracing records and determining species and sizes. Generally, no more than 2 dealer/processor inspections can be accomplished in a day.

Investigations, specifically those of a covert, or undercover nature enable agents to become directly involved in fisheries as participants. They result in increasing our knowledge of how violations occur. This new knowledge is then used to assess past operational modes and determine the most effective modes for future use.

Overt investigations are implicit in all enforcement activities in all modes. Investigations may be accomplished in a day or two, but many take weeks, some take months, and a few take years to complete. The rates applied to investigatory work is the $227 cost per day for a NMFS special agent.

Strategies

Management measures and regulations requiring costly enforcement modes should be limited, and where possible, eliminated. However, fisheries management is a complex issue. Management measures and implementing regulations that are both effective and inexpensive cannot always be found. Generally, dock-side enforcement modes are less costly than at-sea modes, but are more remote from the fishing activity. Regulations based on observed results of a fishing activity or on observations made prior to the fishing activity support the dock-side enforcement mode.

To the extent possible, management measures and regulations should concentrate enforcement efforts into as few enforcement modes as possible. If a critical management measure contains regulations enforceable only by a particular mode, structuring the other regulations so that they too may be enforced by that mode may reduce or eliminate the need for other modes. The

marginal costs of adding requirements to an existing mode are considerably less than the costs of adding a new enforcement mode to a fishery.

The following proposed strategies are designed to increase effectiveness and lower costs. Specific examples are cited for each case and have the support of enforcement officials.

a) Combine two or more modes into one where possible.

The Mid-Atlantic surf clam fishery has a management measure which closes a large area off New Jersey because it contains large numbers of undersize surf clams. Aircraft patrols and boat patrols are made routinely to monitor compliance at a great expense. The same plan contains a measure prohibiting the landing of undersize surf clams. This measure is effectively enforced dock-side at minimum cost to the tax payer. If the at-sea mode was eliminated by eliminating the closed area, and dock-side effort increased to monitor catches for undersized clams, conservation goals are met and enforcement costs are reduced.

The New England groundfish plan contains an important measure which closes two areas in the Northwest Atlantic from March 1 to May 31. Haddock spawn in these closed areas. The Interim Groundfish FMP states that a majority of the haddock in the FCZ spawn in the closed areas during these months. Every year the Coast Guard commits two medium endurance cutters and approximately 5 flights per week to closed area surveillance. Using Table 2, multiplying the daily rate for a medium endurance cutter by 180 days (2 cutters x 90 days) we get $4,587,840. If we multiply the HU-25 falcon hourly rate by 4 hours per day flight time to cover both closed areas, and then by 65 days flown in the 3 month period, we get $598,260. When we combine the aircraft and ship patrol figures we get $5,186,100. Additionally, NMFS agent time and administrative/legal costs involved in case prosecution

increases this figure to about 5.2 million dollars.

By eliminating the closed areas and prohibiting the catching, taking and possession of haddock during the same three months, we protect the entire spawning resource, shift to the dock-side enforcement mode already in use for other management measures, and save approximately 5 million dollars.

Calculations of Coast Guard daily and hourly rates are based on a total dedication to the fishery under discussion. In reality, these figures will always be less because of the Coast Guard's multimission responsibility.

b) Change gear restrictions to gear possession prohibitions.

When gear types are restricted for certain fisheries, but carrying illegal gear on board the vessel is not prohibited, enforcement can only occur at-sea. If the gear can be rapidly changed from illegal to legal, the best enforcement efforts conducted at-sea are rendered ineffective.

Most gear restrictions currently in place are extremely valuable conservation measures. Simple changes in regulations prohibiting the possession of illegal gear would enable enforcement agents to monitor compliance on the vessels at the docks. This would increase efficiency and reduce costs. In most cases, this could occur with very little disruption to normal fishing practices.

Fisheries in New England must use a cod-end with a minimum mesh size of $5\frac{1}{2}$ inches when fishing in a special large mesh area in the FCZ. Smaller cod-ends are carried onboard and used until a cutter arrives on-scene. Once a cutter is in the area, illegal cod-ends are quickly replaced by legal cod-ends.

A similar situation exists in the West Coast salmon troll fishery. The regulations outlaw the use of barbed hooks but allow their possession onboard. Barbed hooks can be changed so quickly that enforcement is

ineffective.

c) Eliminate incidental take provisions.

Many FMPs contain incidential take allowances for species when their possession should be prohibited. An incidental take provision expressed as a percentage of the total catch onboard means agents must inventory entire offloadings and weigh every species to make the correct calculations. Monitoring compliance with incidental catch allowances at-sea is impossible unless the incidental species in the vessel's holds exceeds the amount allowed if the remainder of the holds were filled with other species.

In most cases, the incidental species is also a valuable species. Therefore, every incentive exists for a fisherman who may, in reality, have little or no by catch of the restricted species to conduct a directed fishery until his incidental allowance is satisfied. No incentive exits to avoid a protected species when incidental catches are allowed. If protection of a species is the objective when considering incidental catch allowances, ultimately the species will receive maximum protection at minimum costs through possession prohibitions.

d) Fishing Vessel Transmit Terminals (FVTT)

In its simplest form, the FVTT could be used effectively in any foreign fishery off the U.S. Coast. Observers would carry them onboard foreign vessels and transmit the vessels' positions through a satellite. Because finding foreign vessels in Alaskan waters is a problem to which many ship days and aircraft hours are devoted, the FVTT concept may represent substantial cost savings in this fishery alone. At a minimum, the FVTT would reduce ship and aircraft searching responsibilities that now include locating and identifying authorized vessels. It would also enhance the effectiveness of boarding platforms (more time boarding, less time searching), release more

hours to search for unpermitted, unauthorized vessels fishing in the FCZ, and release more hours for other important enforcement operations.

These strategies, while controversial outside the area of marine fisheries law enforcement offer alternative approaches which promote efficiency at minimum costs.

Conclusion

Often, selecting enforcement modes and developing strategies is limited by annual appropriations, especially when no increases in appropriations occur as new FMPs are approved and implemented. Strategies which produce reasonable levels of compliance through the use of highly effective enforcement modes while keeping cost to a minimum are most desirable. Few enforcement factors are easily quantified or accurately predictable. Relying on past experience to develop new strategies for new plans and to change outdated, ineffective strategies remaining in current plans will result in the most cost effective use of our fisheries law enforcement resources.

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Mid-Atlantic Fishery Management Council. 1981 Amendment #3 to the Fishery Managment Plan for Surf Clam and Ocean Quahog Fisheries. Dover, Delaware

New England Fishery Management Council, 1981. Interim Fishery Management Plan for Atlantic Groundfish. Saugus, Massachusetts

TABLE 1 - ENFORCEMENT MODES AND MANAGEMENT MEASURES

	AT-SEA			DOCK-SIDE		
	Observers	Boarding	Aircraft Surveillance	Vessel Inspection	Dealer/Processor Inspection	Special Investigation
Catch Quotas	+	@	-	@	@	+
Catch-Per Trip	+	@	-	+	-	@
Catch Over Time	+	@	-	+	-	@
Size Limits	+	+	-	+	+	+
Sex/Condition Limit	+	+		+	+	+
Limited Entry		+	@	+		+
Closed Days		+	+	@		+
Closed Seasons		+	+	+	+	+
Closed Areas	+	+	+	-	-	+
Gear Restrictions	+	+	-	@		+
Gear Size	+	+	-	@		+
Gear Materials	+	+	-	+		+
Gear Specs.	+	+	-	+		+
Possession Prohibitions	+	@	-	+	+	@
No discards	+	@	-	-	-	-
Permits	+	+		+	+	
Recordkeeping	+	@		+	@	+

\+ good mode for monitoring compliance

@ average mode for monitoring compliance

\- poor mode for monitoring compliance

TABLE 2 - MODES AND THEIR COST

	$ per day	$ per boarding @ 2 per day	$ per boarding @ 4 per day	$ per boarding @ 6 per day
A. At - Sea*				
1) High Endurance cutter	51,624	25,812	12,906	8,604
2) Medium Endurance cutter	25,488	12,744	6,372	4,248
3) Patrol Boats (82'-95')	5,520	2,760	1,380	920
4) Other Boats	600	300	150	100

	$ per hour	2 hours	4 hours	6 hours	8 hours
B. Aircraft*					
1) HU-25 Falcon Jet	2,301	4,602	9,204	13,806	18,408
2) C-130 Fixed Wing	3,183	6,366	12,732	19,098	25,464
3) Twin-Turbine Helo	2,482	4,964	9,928	14,892	19,856
4) Single Turbine Helo	1,739	3,478	6,956	10,434	13,912
5) Charter aircraft	400	800	1,600	2,400	3,200
C. Observers	200	———	———	———	———

	$ per day	per inspection @ 2 per day	per inspection @ 4 per day	per inspection @ 6 per day
D. Dockside				
1) Vessel inspection				
2) Dealer inspection	$227.00*	$113.00	$57.00	$38.00
3) Special investigation				
4) General patrol				

* From Commandant Notice 7310

Agents average salary including - premium pay, travel equipment
$50,000 - 220 days worked = $227.00

TABLE 3 - MANAGEMENT MEASURES AND THEIR COSTS

Management Measures	COSTS
Catch Quotas - General	-
Catch Quotas - Per Trip	-
Catch Quotas - Over Time	@
Size Limits	-
Possession Prohibitions	- -
Conditions (sex, no egg bearer, etc.)	-
No Discards	+ +
Limited Entry	- -
Closed Hours	+
Closed Days	@
Closed Seasons	- -
Closed Areas - 0-12 miles	@
Closed Areas - 12-24 miles	+
Closed Areas - over 24 miles	+ +
Gear Restrictions - General	-
Gear Restrictions - Sizes	-
Gear Restrictions - Materials	-
Gear Restrictions - Other Specifications	-
Permits	- -
Recordkeeping	-

+ + very expensive
+ expensive
@ moderately expensive
- less expensive
- - least expensive

AN EXECUTIVE SUMMARY OF THE 1985 JOINT FISHERIES ENFORCEMENT STUDY

by

United States Coast Guard

and

National Marine Fisheries Service

An Executive Summary of the 1985 Joint Fisheries Enforcement Study

The U.S. Coast Guard (USCG) and the National Marine Fisheries Service (NMFS) have completed the 1985 Joint Study which estimates fisheries enforcement resource requirements. The study deals primarily with fishery management activities conducted under the Magnuson Act (the Act). The task group developed the methodology by building upon the past two joint studies and combining the results and methods of those studies with 8 years of experience under the Act. I believe the results of this study approximate current levels of resources used throughout the nation for fisheries enforcement.

In a departure from the earlier studies, the 1985 joint study utilized a comprehensive methodology to estimate resource requirements. The methodology concentrated on the following five areas of the fisheries enforcement program:

Domestic Fisheries

At-sea and dockside enforcement requirements for domestic fisheries were determined using a single model and methodology for each individual Fishery Management Plan (FMP).

First, the incentive and ability of fishermen to disobey the regulations, the critical status of the fishery resource, and the complexity of the regulations are examined and rated to determine the number of annual enforcement contacts based on the importance of each factor to effective management of the fishery. The sum of these values (CY or contacts per year) is then multiplied by the active vessel population (VP) to determine the total number of enforcement contacts (TC) required.

$$TC = VP \times CY$$

TC = Total Contacts
VP = Vessel Population
CY = Contacts per Year

Second, the model divides the total number of enforcement contacts between at-sea boardings and dockside inspections based on the nature of the management measures contained in the regulations. If, for example, the FMP employed 6 management measures of which 2 were best enforced at-sea and 4 were best enforced dockside, one-third of the contacts would be conducted at-sea while the remaining two-thirds would be conducted dockside.

The third step requires estimating how many boardings a cutter (or how many inspections a NMFS Agent) could complete in one day (BPD or IPD). This is done by multiplying a geographical factor identifying the likelihood of locating and boarding or inspecting vessels times a management measure factor identifying the time involved in monitoring compliance once onboard.

The final calculation in our model involves dividing the total vessel contacts in a fishery, per year by the number of boardings (TCs) or inspections, (TCd) possible each day. For at-sea enforcement, the result is expressed in cutter days required (CDR) CDR = TCs/BPD. For dockside enforcement, the result is divided by 220 (the average number of work days in a year for the average fisheries agent) and then multiplied by 1.5 to determine man-years required (MYR). The 1.5 multiplication factor is used to

account for agent time spent on activities other than overt dockside inspection and boardings.

$$MYR = \frac{TCD}{IPD} \times \frac{1}{220} \times 1.5$$

Closed Areas

Individual closures were examined to determine the time necessary to patrol the given area, and the desired frequency of patrol based upon the importance of the closed area to effective management of the fishery. Daily, weekly, or bi-weekly patrols were selected to represent high, moderate, and low intensity patrol effort. Cutter and aircraft requirements are calculated by multiplying the time required per patrol by the total number of patrols.

Foreign Fisheries

The estimated cutter requirements for enforcing foreign fishing regulations were determined based upon the number of cutter days needed to board foreign fishing vessels (FFVs) in Alaska once every 90 days on ground and board FFVs in the Northwest Atlantic (NWA) and Washington, Oregon and California Fisheries (WOC) once every 45 days on ground. Thus, the total days on ground in each area is divided by the appropriate standard to determine the total number of boardings required. This total number of boardings is then divided by the average number of FFV boardings that cutters can accomplish. Based on past experience, cutters in Alaska perform an average of 0.5 FFV boardings per day, while cutters in the NWA and WOC perform an average of one FFV boarding per day.

$$CDR = \frac{(DG/FB)}{BPD}$$

DG = Days on Ground
FB = Freqency of Boarding
BPD = Boardings Per Day
CDR = Cutter Days Required

Aircraft Patrols of the EEZ

Aside from aircraft patrols directed at specific closed areas, the study group felt that the total aircraft hour requirements would best be determined by geographic area rather than individual FMP. The study assigned aircraft hours based on historical experience and the need to conduct general patrols of the EEZ as well as extra patrols in the most heavily fished areas of the EEZ.

Non-MFCMA Enforcement Requirements

Non-MFCMA fishery enforcement resource requirements were generally determined by classifying the specific enforcement need under one or more of the above four categories and analyzing the requirements accordingly. For example, enforcing the Lacey Act in the Gulf of Mexico shrimp fishery was treated as a high-intensity area closure during the time period of the Texas closure and a low-intensity area closure during the remainder of the year.

Results

The 1985 joint study estimated that 6920 aircraft hours and 2679 cutter days (64,296 hours) were required for present fisheries law enforcement.

The 1985 joint study called for fewer agent man years and cutter hours but more aircraft hours than the 1980 joint study (as modified to subtract resources devoted to plans that were never implemented). The 1985 joint study is, however the product of a much more rigorous methodology. The following table contains a summary of the results of the studies and FY 1984 resource utilization for fisheries law enforcement:

	Modified 1980 Joint Study[1]	1985 Joint Study[2]
Aircraft	6,343	6,920
Cutter Hours	82,728	64,296
Agent Man Years	185.58	51.81

1. The results of the 1980 Joint Study less resources devoted to plans that were never implemented.

2. Results of 1985 Joint Study.

CANADA'S EXPERIENCE IN MEASURING THE DETERRENT EFFECT OF FISHERIES LAW ENFORCEMENT

by

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Canada's Experience in Measuring the Deterrent Effect of Fisheries Law Enforcement

Edwin Blewett, William Furlong, and Peter Toews[1]

Abstract

The Department of Fisheries and Oceans has conducted evaluations of fisheries law enforcement programs in five regions. A primary focus has been to estimate the deterrent effect of such programs. Since deterrence -- the amount of illegal activity that does not occur because of the threat of sanctions -- is unobservable, the key question is how it can be measured. The methodology described in this paper is based on the economic analysis of participation in illegal activities and data gathered in an interview survey of fishermen. Included are discussions of the design of interview questionnaires, some illustrative deterrence results, and the estimated supply of offences. The paper serves as an introduction to a useful method of estimating the deterrent effect of fisheries law enforcement.

1. INTRODUCTION

1.1 Background

After the Royal Canadian Mounted Police (RCMP), the Department of Fisheries and Oceans (DFO) has one of the largest enforcement programs in the Canadian government. A staff of some six hundred permanent and seasonal fishery officers is charged with enforcing about three thousand regulations covering the Pacific and Atlantic fisheries. Fishery officers carry out a wide variety of fisheries management tasks including prosecution- and prevention-oriented types of enforcement activities.

[1] The authors have been involved in various aspects of the work reported in this paper. Edwin Blewett, of the Regional Planning and Economics Branch, Department of Fisheries and Oceans (DFO), first proposed a deterrence study based on the economic analysis of participation in illegal activities and was the author of the Pacific deterrence study. William Furlong, Professor of Economics at the University of Guelph, made significant improvements to the methodology and was the author of the Quebec deterrence study, the first in which a supply of offences function was estimated. Peter Toews, of the Program Evaluation Branch, DFO, was project manager for all three enforcement evaluations and took the lead in writing the Atlantic deterrence study.

1. Prosecution-oriented enforcement includes:

   - enforcement operations such as apprehensions, seizures, investigations, stake outs, issuing warnings and court appearance notices;

   - court-related duties, meeting with prosecutors, etc.

2. Prevention-oriented enforcement includes:

   - dedicated or non-dedicated patrols by vehicle, boat, or aircraft;

   - habitat referrals, on-site meetings with habitat clients;

   - education, community relations, etc.

The division of enforcement activities into these two groups is somewhat arbitrary, of course, because all of the above activities are prevention-oriented in the sense that they are designed to influence future behaviour towards not committing crime.

The Department of Fisheries and Oceans has conducted evaluations of fisheries law enforcement programs in five regions in Canada -- Pacific, Scotia/Fundy, Gulf, Newfoundland, and Quebec -- to investigate the extent to which they have deterred non-compliance. In carrying out the pre-evaluation plan for the Pacific Region study, it quickly became evident that the objectives of the fisheries enforcement program had never been clearly defined apart from a general objective to attain a high degree of compliance. The lack of more precisely defined objectives did not present a serious obstacle to evaluating the program, however, because the degree to which compliance or other regulatory objectives are being met is always the result of the amount of deterrence an enforcement program is providing. The paramount importance of measuring this primary intended effect of deterrence rather than worrying about achievement of particular objectives was the key finding of the pre-evaluation plan.

After consulting with the RCMP and a number of other government departments with enforcement responsibilities, we learned that nobody had ever tried to measure deterrence. As a result, one-half of the Pacific Region enforcement study budget was committed to finding a means of measuring the deterrence being

provided by the enforcement program. The results of our work in the Pacific fishery reinforced our belief in the usefulness and value of this approach and, in the Atlantic study, 70% of the budget was committed to measuring the deterrent effect of the program.

Deterrence is a non-event. In fisheries, it begins with a fisherman being confronted with an opportunity to break the law. It ends with him deciding that, all things considered, it really isn't worthwhile. Deterrence is the amount of illegal activity that does not take place because of the threat of sanctions. How, then, can it be measured? Because crime prevention is unobservable, most enforcement agencies use the probability of arrest as a performance measure. This cannot be done in fisheries, however, because the total number of offences committed is not known as it is with an offence like homocide. The purpose of this presentation is to discuss the relevance of using fishermen's perceptions to tell us something about both the number of offences being committed and deterrence (i.e., the number of offences not being committed).

1.2. A Primer on the Economics of Crime

The problem of the common property resource is that individual incentives are incompatible with collective interests. In the fishery this translates into excessive stock depletion or overfishing. Authorities have responded to overfishing by imposing restrictions upon individual activity in the fishery. These restrictions form a cornucopia of regulations that includes: limitations on entry by means of licensing, gear restrictions, area restrictions, quotas on catch, minimum size of catch constraints, and landings taxes. Much of the economic literature on the fishery is concerned with the optimal design of fishery restrictions. Regardless of the form of restriction, there exists an economic incentive for individuals to violate the regulations; hence, the regulations must be enforced.

The decision to participate in illegal activities is 'rationally' motivated in that a potential offender implicitly weighs the potential benefits and costs of the offence. This is not intended to suggest that considerations such as anti-social or moral codes of behaviour are not important. Rather, once these behavioural factors have been accounted for, any further increase in the economic gains from crime commission relative to the losses is predicted to induce an increase in the offence rate. The economic model of criminal behaviour is particularly appropriate in the fishery where the gains and losses from crime commission are largely monetary.

The commission of any offence presents a set of 'perceived' gains and losses to the offender. In general, the magnitude of the gain is not known with certainty prior to actually committing the offence; the potential criminal forms some subjective perception of the value of the gain. Similarly, success at crime is not known with certainty -- there is some positive probability that the individual could be caught and convicted. Even the penalty that results upon conviction is not certain; the magnitude as well as the form of punishment are variable (e.g., fines, licence suspension, forfeiture of gear and/or catch). In short, the decision to violate a fisheries' regulation is made under conditions of uncertainty. The individual's attitude towards risk is, therefore, an important factor in the decision.

The economic model of criminal behaviour predicts that increases in the perceived losses from crime will induce reductions in the offence rate. This prediction holds even if all individuals are risk preferrers. Further, the relationship between differences in the expected gains and losses, and the decision to commit an offence critically depends upon attitudes towards risk. Optimal crime control policy requires that the expected losses exceed the expected gains. At this point, crime (on average) does not pay and only risk preferrers are still participating in illegality.

The primary objective of any law enforcement agency is crime prevention. The output of law enforcement is, therefore, interpreted as the number of crimes not committed because of the threat of punishment. These, by definition, are unobservable. As a result, many law enforcement agencies employ proxy variables such as the probability of arrest as an index of enforcement effectiveness. The probability of arrest is measured as the ratio of actual arrests to the actual number of crimes committed. In the fishery, the actual number of offences is also unobservable. The vast majority of fisheries' violations are unreported (since most infractions occur at sea, there are seldom any witnesses, and fish don't squeal). Therefore, the extent of non-compliance with fisheries' regulations, and the associated probabilities of arrest and conviction cannot be directly measured, but rather must be estimated.

The data with which these estimates were made were obtained in personal interview surveys of fishermen. The design and evolution of the interview questionnaires are described in Section 2. Some results of the deterrence studies, illustrating how studies such as these can influence program delivery, are presented in Section 3. Section 4 describes our experience in estimating the supply of offences. Conclusions are drawn in Section 5.

2. METHODOLOGY: THE PERSONAL INTERVIEW QUESTIONNAIRES

Examples of the personal interview questionnaires used in each of the three studies are shown in Appendix A. The questionnaires were used to gather data on fishermen's perceptions on enforcement, the extent of non-compliance, and the probabilities, gains, and losses associated with fisheries illegalities. Their design varies, however, reflecting lessons learned as we proceeded from Pacific to Atlantic to Quebec Regions. Some observations on the questions and answers follow. A glossary of variables and variable names is given in Table 2.1.

Probabilities of Arrest, Prosecution, Conviction and Punishment

Probability of arrest, prosecution, conviction, and punishment must be asked separately. The answers are used to indicate the "balance of deterrence" between enforcement and the judiciary, and can enter separately in an estimated "supply of offences" equation. Their product,

$$(1) \quad P_C = P_A * P_{PR/A} * P_{C/P} * P_{PN/C}$$

is the overall probability of conviction used to calculate the expected net return.

In the Pacific and Atlantic studies, P_C includes the probability of being punished given conviction. This started to raise problems in the Atlantic study where questions were asked about the further probability of Ministerial licence suspensions following conviction; the judicial penalties were perceived values (i.e., no probabilities incorporated) but the value of a licence suspension had the associated probability incorporated. In the Quebec study, this different treatment was removed and separate probabilities were asked for each form of punishment. The probability of conviction is defined as the product of the first three terms in (1) and the punishment probabilities enter into the equation for the perceived penalty.

$$(2) \quad PEN = (P_{F/C} * F) + (P_{CA/C} * CA) + (P_{GE/C} * GE) + (P_{L/C} * L)$$

Probabilities were asked as percentages in the Pacific and Atlantic studies, but as whole numbers "out of 100 ..." in the Quebec study. Both methods worked reasonably well.

TABLE 2.1: Glossary of Variables and Variable Names

individual violation rate	IVR
daily violation rate	VR
participation rate	PR
Pr(arrest)	P_A
Pr(prosecution/arrest)	$P_{PR/A}$
Pr(conviction/prosecution)	$P_{C/P}$
Pr(punishment/conviction)	$P_{PN/C}$
Pr(fine/conviction)	$P_{F/C}$
value of the fine	F
Pr(catch forfeiture/conviction)	$P_{CA/C}$
value of forfeited catch	CA
Pr(gear forfeiture/conviction)	$P_{GE/C}$
value of forfeited gear	GE
Pr(licence suspension/conviction)	$P_{L/C}$
value of lost fishing time	L
perceived penalty	PEN
illegal gain share	IGS
illegal gain	G

Gains and Losses from Non-Compliance

When asking about the perceived illegal gain from committing a violation, a key is what the catch would have been if there had been no violation. For some violations, such as fishing in a closed area, the entire catch may be illegal; other violations such as mesh (and other gear) violations result in part of the total catch being illegal. The question was variously worded as:

(i) How much would an individual likely gain from this kind of violation?

_____ % of catch $ _____

(ii) How much would a vessel likely gain from one violation of this kind?

$_____

(iii) If a fisherman chose not to commit the violation,
(a) by what percent would his catch be reduced? _____ %
(b) by how many dollars would his income be reduced? $ _____

There are several valuable lessons to be learned.

First, as mentioned above, the incremental catch attributable to the violation over and above what would have been caught if no violation were committed is of interest. This was explained in the course of asking the question in the Pacific and Atlantic studies. An attempt was made to reduce ambiguity in the Quebec study by re-phrasing the question, but it still leaves vague what the alternative is (i.e., whether not committing the violation means fishing legally or not fishing at all).

Second, it is important to be clear whether this is a gain per violation, per trip, or per season. We repeatedly ran into problems because the time frame associated with the illegal gain was mixed up. In the Atlantic study, we asked a separate set of questions at the end of the interview about the violation "over an entire season and for everyone involved." These were useful in estimating values of variables such as the total illegal catch over the course of a season or the illegal share of total catch, but were of limited use in helping to refine estimates of variables appropriate to the individual vessel or violation.

Third, if the answer to this question is to be used only to calculate the expected net return (as in the Atlantic study), then only a dollar value is required. If it is to be used in conjunction with other data to calculate the illegal share of total catch (as in the Pacific and Quebec studies), then a physical share is also required. The latter will usually be the case.

Questions on the loss associated with conviction varied little among studies. In each case, the dollar value of expected fines, catch forfeiture and gear forfeiture were asked. The value of the loss associated with Ministerial licence suspensions was asked in a separate question since this penalty is imposed by a different hand after the judicial penalty is decided. Probabilities of licence suspension were asked in the Atlantic study; probabilities of all penalty forms were asked in the Quebec study.

Participation and Violation Rates

In the Pacific study, we asked only about the overall violations rate

(e.g., number of illegal nets set as a proportion of the total number of nets set).

In the Atlantic study, several questions were asked:

(i) How often would an individual likely commit such a violation?
_____ % (of time/sets/days)

(ii) What percentage of vessels would likely commit such a violation at least once? _____ %

(iii) How often does such a violation occur? _____ % (of time/set/days)

These questions are asking about: (i) the individual's violation rate, (ii) the participation rate, and (iii) the overall violation rate. These variables are related as follows:

(3) VR = IVR * PR

That is, if one-half the population participates in an illegal activity and, on average, they commit the crime 20% of the time, then the overall violation rate will be 10%.

These data are useful to make the interesting distinction between "folk violations" and "organized crime". The former tend to be common violations that a large proportion of the population commit occasionally. The latter are more serious crimes -- usually with large gains and hopefully with adequate penalties and probabilities -- that are virtually the full-time occupation of one or a few individuals. In British Columbia, the best example is people who traffic illegally in herring roe-on-kelp.

This distinction may very well be clear from the description of the violation, so in the interests of brevity in the interview and to avoid possible confusion about very closely related concepts, we recommend inquiring only about the overall violation rate. This variable is essential for:

- describing the seriousness of non-compliance

- estimating the supply of offences equation and the level of deterrence

- calculating actual probabilities of arrest (in conjunction with data on actual arrests).

Socioeconomic Variables

In the Quebec study, interviewees were asked a number of questions regarding their current socioeconomic status as it might affect their participation in fisheries illegalities. These included:

- age
- family size
- number in family who work in the fishery
- number in family unemployed
- percent of household income earned in the fishery
- whether previously convicted of a fisheries offence.

These variables were used in estimating the supply of offences equations and should be repeated in future surveys.

Other Variables

1. In the Quebec study, interviewees were asked what percent of the total catch is taken by individuals without a licence. This question attempts to measure the amount of illegal activity in the fishery that is missed by restricting the interview sample to licensed participants. Also, by asking this question first it is hoped that poachers will be set up as the culprits, thereby bringing the interviewee "on side" and minimizing the degree of strategic answering.

   The amount of total catch taken by non-licensed fishermen is used in the estimate of the total illegal catch.

2. In the Pacific study, following questions about probabilities and penalties, we asked for qualitative responses to the question, "How much of a deterrence is this?" These were interesting to gauge the general impression of enforcement effort and judicial decisions but are

probably not useful enough to justify their inclusion. The responses were not used in any of the formal analysis.

3. In the Atlantic study, interviewees were asked, "What would the level of the penalty have to be to create an adequate deterrent effect?". Responses indicated acceptable upper bounds on penalties but, again, they were not used in the formal analysis.

3.0 SOME DETERRENCE RESULTS AND IMPLICATIONS FOR PROGRAM DELIVERY

The interview survey data was used to analyze the extent of deterrence and non-compliance in the fisheries. Recommendations for short- and long-term improvements in the enforcement programs were based on these analyses. In this section, some illustrative findings and their implications for program delivery are described.

Examples of illegal gains, penalties, and probabilities as perceived by Pacific coast fishermen are shown in Table 3.1. The range of magnitudes under Illegal Gain varies from $25 for Trollers fishing with barbed hooks to $60,000 for Seiners fishing in closed areas or during closed times. Perceived penalties exceed perceived gains, but their relative magnitudes vary considerably. In the

TABLE 3.1: Examples of Illegal Gains, Penalties, and Probabilities as Perceived by Pacific Fishermen

Gear Type and Violation	Value of Perceived		Probability of Apprehension and Punishment	Value of Expected		
	Illegal Gain	Penalty		Illegal Gain	Penalty	Net Return
Gillnet:						
Creek Robbing	$ 1,500	$ 2,500	0	$ 1,500	$ 0	$ 1,500
Seine:						
Area	5,000	20,250	.0099	4,951	200	4,751
Violations	60,000	100,000	.009	59,460	905	58,555
Troll:						
Barbed	25	525	.0099	25	5	20
Hooks	25	1,700	.01	25	17	8

study, the ratio of penalty to gain ranged from less than 2:1 to almost 70:1. Not surprisingly, the penalty:gain ratio tends to vary inversely with the size of the illegal gain. The larger is the potential gain from non-compliance, therefore, the more difficult it is to create a credible deterrent effect.

Penalties are comprised of fines, value of catch forfeited, value of gear forfeited, and value of lost fishing time (either during apprehension and investigation or because of licence suspension following conviction). In most cases, fines are an insignificant part of the total ranging from $100 to $500 and generally accounting for less than 10% of the total perceived penalty.

This creates a problem and an opportunity: not enough deterrence is currently being created but higher fines offer an avenue to remedy the situation. In Alaska, for example, the average fine for commercial violations is about ten times as high as in British Columbia. Fines of $30,000 are not uncommon for serious commercial fishery violations. Catch and gear are always forfeited and vessels, if owner-operated, are subject to forfeiture. There were a number of cases where 30 day jail terms were also imposed.

The largest share of the perceived penalty was found to be due to perceptions of losses incurred as a result of confiscated catch, forfeited fishing gear, and lost fishing time. These penalties are all related to the magnitude of the illegal gain either directly, as with catch, or indirectly, as with gear and lost fishing time. Penalties that are specified in relative rather than absolute terms are better able to create a significant deterrent effect, especially for violations characterized by large illegal gains.

Probabilities of apprehension and punishment are shown in the third column of Table 3.1. These estimates are the product of four probabilities: apprehension, prosecution, conviction, and punishment. When these four probabilities were examined more closely, a striking pattern emerged. The latter three judicial probabilities are all perceived to be at or very near 100% but the probability of apprehension is usually around 1%. Overall, perceived probabilities of apprehension and punishment are uniformly low: individuals interviewed believed their chances of being caught and punished for committing a violation were less than one chance in 100.

Probabilities and penalties are such as to make expected net returns from non-compliance positive. These values are shown in the last column of Table 3.1. With fishermen expecting to end up winners as a result of fishery violations, there is not a sufficient deterrent effect. This led to a number of

recommendations to improve program delivery. Because of constraints on obtaining new resources, emphasis was placed on better utilization of existing resources including more planning and direction, establishing goals, increasing accountability, better communications and co-operation with other enforcement agencies.

While we consider the Pacific Region study to be a success, there were several areas that needed improvement. The sample size was too small, some questions were worded ambiguously, and we had no way of correlating enforcement effort with deterrent effect on anything less than a regional basis. We undertook to improve these areas in the Atlantic study.

The Atlantic Study comprised three regions: Scotia/Fundy, Gulf, and Newfoundland. Regions were further divided into three or four zones. Enforcement and deterrence data were collected separately for each zone.

One of the sampling strategies we chose in the Atlantic study was to focus on several fisheries and sample these intensively rather than spreading ourselves around too thinly. The fishery we chose to study most intensively was the lobster fishery which is carried out in all three regions and to which we presently devote a great deal of enforcement effort. Currently, there are about 7,000 to 8,000 lobster vessels in the lobster fishery. These fellows tend to commit four basic types of violations:

i) taking undersize lobsters
ii) taking egg-bearing females
iii) fishing with an excess number of traps
iv) fishing in closed areas

We interviewed about 150 of these small lobster boat owners about these violations. Illustrative results are presented for taking undersize lobster.

Table 3.2 shows data on illegal gains, penalties, and probabilities from this study. As in Pacific region, gains vary among violations and regions, and penalties exceed gains. The penalty:gain ratio is higher in the Atlantic, however, as are the probabilities of apprehension and punishment. Both these characteristics reduce the expected net return from non-compliance.

TABLE 3.2: The Atlantic Lobster Fishery: Perceived Illegal Gains and Penalties, and Expected Values of Net Returns.

Region	Value of Perceived		Probability of Apprehension and Punishment	Value of Expected		
	Illegal Gain	Penalty		Illegal Gain	Penalty	Net Return
Scotia/Fundy	$ 59	$ 2,215	.029	57	64	(7)
Gulf	254	10,978	.021	249	230	19
Nfld	110	2,394	.04	105	96	9
All Regions	139	5,792	.029	135	168	(33)

Perceived penalties are in the $8,000 to $13,000 range in Gulf Region whereas they are only $2,000 to $3,000 in Scotia/Fundy and Newfoundland Regions. Despite this advantage, Gulf Region has not managed to get perceptions of apprehension above the 2% to 3% level, and expected net returns are not significantly lower in Gulf than in other regions.

To investigate why penalties are so much higher in Gulf Region, we took a closer look at the components of perceived penalties. In Gulf Region, licence suspensions generally account for 50% to 90% of the total perceived penalty. The perceived cost of a licence suspension, shown in Table 3.3, averages about $9,200 in both Scotia/Fundy and Gulf regions. Average licence suspensions are believed to last for about three weeks in Gulf Region but only two in Scotia/Fundy. The probability of getting a suspension is perceived to be about 90% in Gulf but only 40% in Scotia/Fundy. The net result of the lower probability in Scotia/Fundy is an expected penalty of $3,700 in contrast to $8,400 in Gulf. Gulf Region managed to instill higher perceptions of penalties through concerted and consistent application of its licence suspension policy.

TABLE 3.3: Atlantic Lobster Violations: Perceived Costs and Expected Values of Ministerial Licence Suspensions

	Licence Suspension		Perceived Probability of Suspension:		Expected Value of Suspension
	Perceived Cost	Perceived Duration	1st Offence	2nd Offence	
Scotia/Fundy	$9,280	2 weeks	40%	100%	$3,710
Gulf	$9,220	3 weeks	91%	100%	$8,390
Newfoundland	$2,710	2 weeks	75%	98%	$2,030

As in the Pacific fishery, the probabilities of being prosecuted, convicted and punished are generally high. Probabilities of apprehension, on the other hand, are certainly higher than in the Pacific, but they are low relative to the perceptions Atlantic fishermen have of judicial probabilities. There is some justification for high perceptions of the effectiveness of the judicial system. DFO has been averaging about 1,500 prosecutions per year in the Atlantic fishery for the past few years with an 85% to 90% conviction rate. Seventy percent of those brought to trial plead guilty, so of the remaining thirty percent about half are convicted.

Perceived violation rates and expected net returns per violation were correlated for each of the lobster violations. These correlation coefficients are very high for the trap limit and area violations (.944 and .986 respectively) and moderately high for the undersized violation (.866). For the berried female violation, the correlation coefficient is negative (-.277). This appears to indicate that factors other than those in our model motivate this type of illegality.

In the Quebec Region study, the survey questionnaire was expanded to include a number of socio-economic questions. These were used to estimate supply of offences equations, as discussed in the next section. Some deterrence

TABLE 3.4: Perceived Probabilities of Arrest, Prosecution and Conviction in the Quebec Lobster Fishery

	Probability of Arrest	Probability of Prosecution Given Arrest	Probability of Conviction Given Prosecution	Probability of Conviction
Gaspe				
Trap Limit	.212	.477	.614	.062
Undersized	.302	.512	.522	.081
Iles-Madeleine				
Trap Limit	.025	.863	.854	.018
Undersized	.093	.751	.838	.059
Atlantic				
Trap Limit	.057	.877	.893	.045
Undersized	.073	.947	.933	.064

results illustrating our findings are presented below for lobster fishermen on the Gaspe Peninsula and les Iles de la Madeleine.

There were thirty interviews of lobster fishermen in the Gaspe Peninsula (hereafter GP) and thirty on Iles de la Madeleine (hereafter IM). Each fishermen was asked to state his perceived probability of arrest, prosecution, and conviction. The average of each response is presented in Table 3.4 for the two violations examined in this fishery: exceeding the trap limit and taking undersized lobster. The corresponding figures drawn from the Atlantic study are also presented for purposes of comparison.

A striking feature of the data presented in Table 3.4 is the unusually high perceived probability of arrest for both violations in GP. For example, fishermen believe there is a 30% chance of getting caught taking undersized lobster in GP but only a 9% chance in IM. This latter figure is in line with the seven percent probability for the Atlantic. A similar pattern emerges for the probability of arrest for trap limit violations.

On the other hand, the conditional probabilities of prosecution and conviction are remarkably lower in GP than in both IM and the Atlantic. One would expect the pattern of a low probability of arrest and very high conditional probabilities of prosecution and conviction to emerge in all cases.

In the fishery, where evidence of guilt is often immediately available upon arrest, it is likely to be more costly to produce an arrest than a prosecution or a conviction once an arrest has been made. It would be cost effective, therefore, to prosecute and convict a large proportion of arrests, but to arrest only a small proportion of offenders -- the same amount of deterrence is produced at a lower cost. This is particularly true for offences such as area violations where it is prohibitively costly to effectively police all closed areas and thereby produce arrests.

The probability that an individual who commits an offence will be convicted is calculated by taking the product of the probability of arrest, the probability of prosecution given arrest, and the probability of conviction given prosecution. The probabilities of conviction for trap limit and undersized lobster violations are reported in the last column of Table 3.4. While the probabilities of conviction are higher in GP than in both IM and the Atlantic, they are generally not of a different order of magnitude. Note that the likelihood of conviction in the Atlantic lies between the two Quebec area

TABLE 3.5: Actual Warnings, Prosecutions and Convictions in the Lobster Fishery, 1984.

Number of:	GASPE	ILES-MADELEINE
Warnings for Undersized Lobster	89	32
Prosecutions for Undersized Lobster	21	17
Potential Arrests for Undersized Lobster	110	49
Convictions for Undersized Lobster	7	14
Lobster Licences	223	325
Seized Traps	456	920
Ratio of:		
Potential Arrest/Licences	.49	.15
Prosecutions/Licences	.09	.05
Prosecutions/Potential Arrests	.19	.35
Convictions/Prosecutions	.33	.82

probabilities for both violations. This suggests some measure of credibility for the Quebec data.

In view of the anomalous relative magnitudes of the perceived probabilities of arrest and prosecution in GP, one might be tempted to dismiss the data as unrealistic. It is worthwhile to contrast these results with the actual numbers of arrests, prosecutions, and convictions. These are presented in Table 3.5 for the year 1984.

The sum of warnings and prosecutions can be viewed as the number of 'potential arrests' where an individual is caught committing a violation (although in some cases an official arrest and charge may not be made). The total number of potential arrests on GP is more than double that on IM. On the other hand, the number of convictions for undersized lobster on GP is only one-half the number on IM.

It is difficult to determine the actual probability of arrest since that requires knowledge of the actual number of violations which is unknown. However, if violation rates are similar in the two regions, then the ratio of potential arrests to the total number of licences yields insight into the relative magnitude of the probability of arrest. This ratio on GP is more than three times greater than on IM. Thus, with the assumption of similar regional violation rates, the data support the ranking of perceived probabilities of arrest presented in Table 3.4. Furthermore, the ratio of prosecutions to potential arrests (which can be interpreted as the probability of prosecution given arrest) and the ratio of convictions to prosecutions (which is similar to the probability of conviction given prosecution[2]) are each remarkably smaller on GP than on IM. In summary, the data reflecting actual arrests, prosecutions and

TABLE 3.6: Components of Perceived Penalties in the Lobster Industry

	GASPE		ILES-MADELEINE	
	Trap Limit	Undersized Catch	Trap Limit	Undersized Catch
Probability of:				
Fine	.652	.562	.838	.810
Catch Forfeiture	.613	.312	.340	.667
Gear Forfeiture	.128	.000	.500	.000
Licence Suspension	.009	.001	.315	.262
Perceived Value of:				
Fine	$ 224	$222	$ 297	$ 250
Catch Forfeiture	$ 74	$248	$ 150	$ 94
Gear Forfeiture	$ 56	$ 0	$ 487	$ 97
Licence Suspension	$1710	$667	$4250	$4475
Perceived Penalty	$ 172	$203	$1882	$1438
Length of Licence Suspension in Weeks	1.07	0.03	1.37	1.63
% Aware of Ministerial Policy	40%		87%	

[2] This interpretation is somewhat misleading because it does not correct for files that are still open. Additional convictions may be rendered in 1985 on charges that were laid in the previous year. Thus, the reported probability of conviction given prosecution will be smaller the greater is the number of open files as is the case in GP.

convictions strongly support the regional rankings of perceived probabilities reported in Table 3.4.

Probabilities and magnitudes of perceived penalties for the two violations examined in the lobster fishery are presented in Table 3.6. For each violation in each region, fishermen report that the most likely form of punishment is by fine. However, the likelihood of being fined upon conviction in IM is over 80% for both infractions while in GP it is 65% for exceeding the trap limit and 56% for taking undersized lobster. The only penalty that is more likely in GP than in IM is forfeiture of catch for trap limit violations. This difference in probable punishment is most striking for licence suspensions where, for example, there is perceived to be a 1% chance of licence suspension for trap violations in GP but a 32% chance in IM. The distribution of responses is also noteworthy. Of the 30 fishermen interviewed in GP, 20 report a zero probability of licence suspension for undersized catch, and 24 give a similar answer for trap limit offences. On the other hand, the corresponding responses of zero probability on IM (where there were also 30 interviews) are 2 and 10 for undersized catch and trap limit violations, respectively. Thus, there is considerable agreement among fishermen that there is a zero likelihood of licence suspension in the GP lobster fishery, but a positive and significant likelihood in IM.

This suggests some concern that Ministerial sanction with respect to licence suspensions may be inequitably administered between the two areas. The ratio of actual licence suspensions to actual convictions would indicate if this concern is valid. Unfortunately, these data are not immediately available. The discrepancy in the perceived probabilities of licence suspension may be partly attributed to the difference in the degrees of policy awareness in the two regions. Eighty-seven percent of the interviewees in IM respond that they are aware of Ministerial policy with respect to licence suspensions, while only forty percent in GP give a positive response.

The perceived magnitudes of each class of penalty are also presented in Table 3.6. The average perceived fine is remarkably consistent across violations and regions, ranging from $222 to $297. This range is comparatively less that the corresponding fines for the Atlantic where the regional average is $620. The only category in which the GP fishermen perceive a more severe penalty than their counterparts on IM is the forfeiture of catch for undersized lobster. In all other categories the perceived penalties are greater on IM than on GP. This trend is particularly pronounced for gear forfeiture and licence suspension. Part of the larger cost of a licence suspension on IM can be

explained by differences in the perceived length of the suspension. For example, the GP fishermen believe that the typical suspension for trap limit violations lasts approximately one week, while on IM the average suspension duration is perceived to be 1.6 weeks.

Both the severity and the likelihood of punishment are generally greater on IM than on GP. One hypothesis that would explain these differences is a possible disparity in the attitude of the courts towards fisheries' infractions. The likelihood of conviction and the magnitudes of penalties are largely determined by the courts. The only forms of sanction primarily controlled by fisheries officers are the probabilities of arrest and prosecution. If fisheries officers perceive an unsupportive court (in the sense that it is less inclined to convict and, when it does, lenient penalties are awarded), then one would expect fewer prosecutions to be processed or charges laid. However, one would also expect to observe a relatively large proportion of warnings and high probability of arrest, as less time is allocated to prosecution related activities and more to preventive. This is exactly the picture that unfolds in GP.

The perceived penalty for each violation is calculated by summing the perceived values of the four components of punishment with each component weighted by its corresponding probability. As is shown in Table 3.9, the perceived penalty for trap limit violations in GP is $172, but in IM it is eleven times greater at $1882. Further, the perceived penalty for undersized lobster on IM is seven times greater than that in GP. The greatest proportion

TABLE 3.7: Expected Penalties and Expected Gains from Non-Compliance in the Lobster Industry

	Value of Perceived			Value of Expected		
	Illegal Gain	Penalty	Probability of Conviction	Illegal Gain	Penalty	Net Return
Gaspe Peninsula						
Trap Limit	$ 94	$172	.062	$ 86	$11	$75
Undersize	$127	$203	.081	$116	$18	$98
Iles de la Madelaine						
Trap Limit	$130	$1882	.018	$128	$34	$94
Undersize	$112	$1438	.059	$105	$85	$20

of the perceived penalties on IM is due to the impact of licence suspensions. In GP, the bulk of the perceived penalty comes from fines.

It is argued above that, in the fishery, a small probability of arrest coupled with large conditional probabilities of prosecution and conviction is likely to be cost effective. Similarly, for law enforcement in general, a small likelihood of conviction coupled with large monetary penalties is efficient. Production of arrest, prosecutions, and convictions requires an expenditure of resources by DFO. The payment of penalties is simply a transfer of property rights, the cost of which is entirely borne by the offender. Therefore, to the extent that greater severity of punishment can be substituted for lower likelihood of conviction in the production of crime prevention, it is in DFO's economic interest to do so. Considerations that limit the extent to which this trade-off can be effected are discussed below.

Gains, penalties, and probabilities are presented in Table 3.7. As with perceived values, discussed above, expected penalties are considerably larger on IM than on GP although the degree to which they are larger has diminished due to the relatively larger probabilities of conviction on GP.

The expected gain is of a similar order of magnitude for all violations. The expected return to trap limit violations on IM is $42 greater than the same offence on GP in spite of a markedly larger likelihood of conviction in the latter region. The expected gains from undersized lobster violations in Quebec are in line with the Atlantic results, but the expected gain from trap violations is somewhat smaller in Quebec than in the Atlantic.

The expected net return per day for each infraction is calculated by subtracting the expected penalty from the expected gain. These are reported in the last column of Table 3.7. For each of these violations, crime pays. A standard theoretical result in the economics of crime is that when likelihood and severity of punishment are optimally set, the expected net return from crime commission is negative so that, on average, crime does not pay. At this point, only risk preferrers participate in illegal activities. Therefore, to the extent that the above figures reflect actual values, the combination of penalties and likelihood of conviction in the lobster fishery is too low. One or more of these policy instruments should be increased to produced a negative expected net return. Which instrument should be increased and to which level is a more complex problem that will be discussed in the next section of this paper.

4.0 ESTIMATING THE SUPPLY OF OFFENSES

This section discusses the responsiveness of violation rates to changes in the policy instruments: the severity and likelihood of punishment. Multivariate regression analysis is employed to estimate the violations response function, which is also referred to as the supply of offences equation. The dependent variable in the relationship (i.e., the violation rate) depends upon a number of explanatory variables that reflect the gains and losses from crime, as well as socioeconomic factors that might also explain participation in illegal activities. Ideally, it is desirable to isolate the unique and independent influence each of the explanatory variables has upon the dependent variable. For example, one might calculate the correlation between the violation rate and the probability of arrest. This is done by investigating how the violation rate changes in response to changes in the probability of arrest in a particular set of observations (these observations would be interviews of fishermen). However, not only does the probability of arrest vary across observations but so do all other explanatory variables. Thus, the observed behaviour of the violation rate cannot be attributed solely to changes in the probability of arrest. To isolate the influence of any single explanatory variable on the violation rate, all the remaining explanatory variables would have to be held constant. Regression analysis, in principle, does exactly this. When the explanatory variables are not themselves strongly correlated,[3] regression analysis statistically corrects changes in other explanatory variables so that unique and independent influences on the dependent variable may be identified.

The basic idea of regression analysis is to estimate a curve that best explains or fits a set of observations. This is explained with the aid of the example shown in Figure 4.1. The observations are the combinations of violation rate and probability of conviction reported in each interview. These are represented by the dots in Figure 4.1. For example, the i^{th} individual may have reported rate V_i and a probability of conviction P_i. Regression analysis estimates a line that best explains the observations. As drawn, the fitted or estimated line has two parameters: the constant or intercept, c, and the slope, B. The economic model of criminal behaviour predicts this particular slope to be negative: an increase in the probability of conviction deters crime at an estimated constant rate of B. The following discussion of regression results is intended not to explain regression analysis, but rather how to interpret the

[3] When the explanatory variables are themselves strongly correlated a statistical problem known as multicollinearity is present. This means that the impacts of the correlated explanatory variables on the dependent variable cannot be properly disentangled or separated.

results. Comments that are of a more technical nature are given parenthetically.[4]

The study of non-compliance in Quebec was restricted to selected marine fisheries. These fisheries were chosen by DFO on the basis of relative importance to the Quebec fishing industry and likely prevalence of illegal activities. The selected fisheries include four species: lobster, crab, shrimp, and groundfish. To achieve as much homogenity as possible within each sample, each fishery is subdivided by gear type and location. A complete classification is provided in Table 4.1.

Wherever two violations were examined in a single fishery, each interviewee was questioned on both violations. Double interviewing may be subject to "order bias" where the responses from the second interview would be different had it been conducted first. This problem is fully acknowledged. However, doubling up is a cost effective means of increasing sample size. Sample sizes were chosen to achieve an error margin of 20% at a confidence level of 95%. This combination of precision and confidence allows statements such as the following to be made: "We are 95% confident that the mean violation rate in the sample does not differ from the mean rate in the population by more than 20%."

The violations response function for the lobster fishery is estimated for a pooled sample of both trap limit and undersized catch violations in both Gaspe and Iles de la Madeleine[5] (the function is distinguished across zones and violations by means of dummy variables). There is a total of 120 observations in the lobster sample -- thirty interviews for each violation in each zone. Several explanatory variables have been dropped from the estimating equation because preliminary results showed them to have weak explanatory power, or to be strongly correlated with other explanatory variables. The following estimated supply of offences is obtained for the lobster fisheries.[6]

[4] The interested technical reader is referred to Johnston (1984) and Pindyck and Rubinfeld (1976) for more rigorous explanations of multivariate regression analysis.

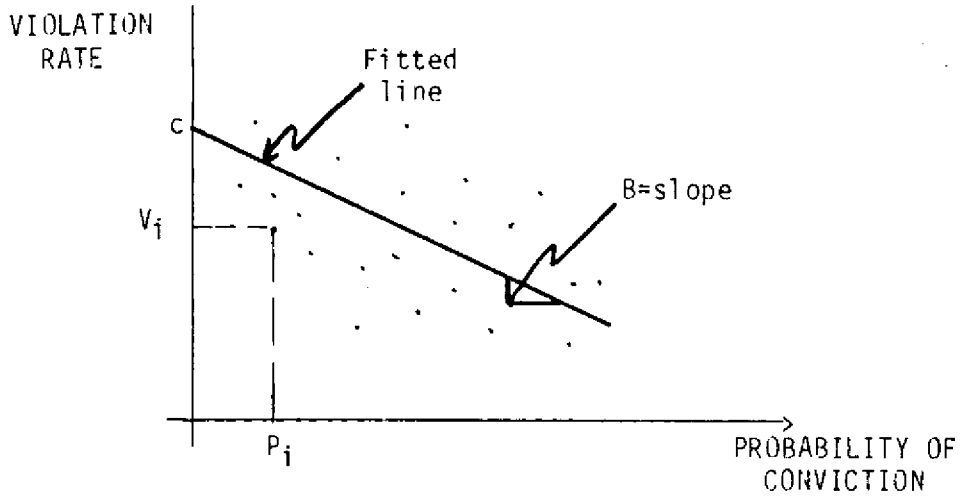
[5] Attempts were made to estimate individual response functions for each zone and each violation. However, the estimates were unsatisfactory due to unacceptably low t-statistics which is caused by multicollinearity. The only way to correct multicollinearity is to increase sample size.

[6] The equation is assumed to be linear, and is estimated by ordinary least squares. The R^2 is .20, which is quite reasonable for a cross-section sample.

TABLE 4.1: Selected Fisheries, Violations and Sample Sizes

Fishery	Location	Violation	Population Size	Sample Size	No. of Interviews
Crab (inshore)	Northshore	1) trap limit exceeded	113	20	20
		2) undersized catch		20	
Crab (offshore	Quebec	3) trap limit exceeded	47	16	16
		4) undersized catch		16	
Lobster	Gaspe	5) trap limit exceeded	223	30	30
		6) undersized catch		30	
	Iles-Madeleine	7) trap limit exceeded	325	30	30
		8) undersized catch		30	
Shrimp	Quebec (G. & N.S.)	9) closed area	44	16	16
Groundfish I (fixed gear, less than 65')	Gaspe	10) illegal net	574	23	23
	Northshore	11) illegal net	646	23	23
	Iles-Madeleine	12) illegal net	141	21	21
Groundfish II (mobile gear less than 65')	Gaspe	13) illegal net	55	17	17
		14) closed area		17	
	Iles-Madeleine	15) illegal net	27	15	15
		16) closed area		15	
Groundfish III (mobile gear, greater than 100')	Iles-Madeleine	17) closed area	5	5	5
Totals				344	216

Figure 4.1: Fitting a Regression Line



$$VR = \underset{(3.99)*}{0.328} - \underset{(0.31)}{0.036P_A} - \underset{(1.56)*}{0.086P_{C/P}} - \underset{(0.19)}{0.027P_C} - \underset{(0.77)}{0.0002PEN}$$

$$+ \underset{(1.50)*}{0.005G} + \underset{(1.39)*}{0.058CON} + \underset{(0.72)}{0.033UR} - \underset{(1.86)*}{0.132INC}$$

$$- \underset{(1.47)*}{0.002AGE} - \underset{(1.37)*}{0.019FF} - \underset{(0.82)}{0.021TRAP} + \underset{(1.84)*}{0.068GP}$$

where

VR	=	the violation rate
P_A	=	the probability of arrest
$P_{C/P}$	=	the probability of conviction given prosecution
P_C	=	the probabilty of conviction
PEN	=	the perceived penalty measured in $00's
G	=	the perceived gain measured in $00's
CON	=	a dummy variable for previous convictions
UR	=	the household unemployment rate
INC	=	the percentage of household income derived from the fishery
AGE	=	the age of the interviewee
FF	=	the percentage of the family that works in the fishery
TRAP	=	a dummy variable for trap violations
GP	=	a dummy variable for Gaspe

The numbers that appear immediately before the explanatory variables are the estimated coefficients, or slopes of the response function. The numbers below the coefficients and in parentheses are t-statistics which will be explained later. Each coefficient indicates the response in the violation rate to a unit change in the explanatory variable. For example, since the perceived penalty is measured in hundred dollars units, an increase in the average penalty by one hundred dollars is predicted to decrease the violation rate by .0002. On the other hand, since the probabilities are measured as fractions, a unit increase in these is equivalent to an increase of 100% (e.g., from a probability of 0.02 to 1.02). Therefore, it is more meaningful to talk of a single percentage point change in a probability (e.g., from 0.02 to 0.03). For example, a single percentage point increase in the probability of arrest is estimated to decrease the violations rate by .00036 (i.e., .036 x .01). Thus, the scale in which the explanatory variables are measured is critically important to the interpretation of the coefficients.

The first thing to note in the estimated supply of offences equation is that all the gain and loss variables exhibit the hypothesized influence on violations. The socioeconomic variables also have intuitively appealing affects on participation in illegal activities. An increase in the share of family income derived from the fishery, or in the proportion of the family employed in the fishery, is estimated to decrease the supply of lobster infractions. An increase in the household unemployment rate will increase illegality. The more dependent is the family on the fishery, the greater is the family's interest in its future sustainability, and the greater will be the respect for regulations designed to preserve the resource. However, a larger unemployment rate implies a greater immediate need for household income creating a stronger incentive to violate regulations. These impacts are confirmed by the signs of the coefficients associated with INC, FF, and UR. The older the interviewee, the smaller is the reported violation rate; generally, it is believed that risk aversion increases with age.

The variable CON is a dummy variable that equals one if the interviewee has been previously convicted of violating a fishery regulation, and zero otherwise. The positive coefficient associated with CON indicates that previously convicted individuals report a violation rate that is, on average, 0.58 greater than other individuals when all other factors have been accounted for. Diagrammatically, the coefficient of a dummy variable is interpreted as a change in the constant or intercept of the violations response function. To the extent that the reported violation rate reflects the interviewee's personal violation rate, these individuals exhibit a relative proclivity for crime.

A dummy variable is also constructed for the type of infraction. When the violation is a trap limit violation, the variable TRAP equals one, and when it is undersized catch, TRAP is set at zero. Similarly, a dummy variable GP is created to allow for differences in the violation response function across zones. When the interview forming the observation takes place in Gaspe, GP equals one, and zero otherwise. The estimated coefficients for these two dummy variables indicate that if all other explanatory variables are equal across infractions and zones, the violation rate of excessive traps is 0.21 less than for undersized catch, but .068 larger in Gaspe. Since the mean violation rate for the sample is .121, these adjustments represent changes of -17% and +56%, respectively.

The t-statistics reflect the level of statistical confidence in the estimated coefficients. All t-values marked with an asterisk are statistically significant at a 90% confidence level or greater. That is to say, the estimated coefficient is not zero in at least nine of ten samples. As displayed in the estimated equation, most of the coefficients associated with the socioeconomic variables are statistically significant. Among the coefficients for the policy instruments, only the probability of conviction has a significant coefficient.[7]

A single percentage point increase in the probability of conviction given prosecution is predicted to have more than double the impact on violations than the probability of arrest, and more than triple the impact of a percentage point increase in the probability of conviction. Further, since the probability of conviction given prosecution is substantially greater than the other two probabilities, a one percentage point increase in this variable represents a much smaller percentage increase.[8] It seems reasonable to assume, therefore, that a percentage point increase in the probability of conviction given prosecution can be achieved at a lower cost than similar increases in the other probabilities.[9] A percentage point increase in the probability of conviction given prosecution is predicted to decrease the violation rate by .00086 which represents a 0.7% decrease in violations (the mean violation rate is .121). An increase in the average penalty by a hundred dollars is estimated to reduce

[7] There is some collinearity among P_A, $P_{C/P}$ and P_C which tends to reduce their associated t-statistics.

[8] For example, suppose $P_{C/P}$ = .80 and P_A = .20. A single percentage point increase in each is an increase of .01; which translates into percentage increases of 1.25% and 5%, respectively.

[9] Unfortunately, the probability of prosecution given arrest could not be included because of strong correlation with other probabilities.

violations by 0.2%. Therefore, increases in the conditional probability of conviction is estimated to have a stronger deterrent effect, and constitutes a more reasonable increase.

Preliminary estimates and tests also indicate it is necessary to pool all of the crab interviews into a single sample to obtain statistically meaningful results. Again, dummy variables are constructed to distinguish between trap limit and undersized catch violations, as well as between the inshore and offshore fisheries. The pooled sample consists of 54 observations (sixteen for each of the two violations in the offshore fishery, and eleven for each violation in the inshore). The following estimates for the crab fishery proved to be the most robust:[10]

$$\begin{aligned} VR = {} & \underset{(2.48)^*}{0.197} - \underset{(0.69)}{0.047P_C} - \underset{(2.11)^*}{0.026F} - \underset{(3.00)^*}{0.011G} - \underset{(0.92)}{0.044CON} \\ & + \underset{(1.71)^*}{0.148UR} + \underset{(0.77)}{0.007INC} + \underset{(0.42)}{0.017TRAP} - \underset{(3.33)^*}{0.160INS} \end{aligned}$$

where the new variables are:

F = the fine measured in $00's
INS = a dummy variable for the inshore fishery.

The signs of the coefficients confirm that all of the included explanatory variables have the hypothesized impact on violations. The effect of fines on violations in the crab fishery is substantial. If fines are increased by a hundred dollars, the violation rate will decrease by .026. Since the mean of the dependent variable is .153, this represents a 17% decrease in violations. To achieve an equivalent deterrent effect, the probability of conviction would have to be increased by 5.5 percentage points, which is likely to be quite costly in terms of resources (for trap limit violations in the offshore fishery, 5.5 percentage points means doubling the current probability of conviction).

The coefficient associated with the inshore dummy variable is large and statistically significant. When all other factors are held constant, the

[10]The relatively small sample size necessitated that several variables be dropped to avoid multicollinearity; these include all of the downstream probabilities, and most of the penalty components. In addition, other variables were dropped because of poor explanatory power and weak statistical significance. The associated coefficient of determination is remarkably high at .39; that is, 40% of the variation in VR is explained by this equation.

violation rate in the inshore fishery is .16 less than in the offshore. There does not appear to be any difference in the violations response function for trap limit and undersized crab infractions. The coefficient for TRAP is statistically insignificant. The household unemployment rate, UR, and the percent of household income from the fishery, INC, have the same impacts on violations in the crab fishery as they do in the lobster fishery.

All 58 interviews in groundfish I (fixed gear, less than 65') are also pooled into a single sample. The violations response function is distinguished across the three zones by means of dummy variables. The following estimated response function for groundfish I was obtained after preliminary tests and trials.[11]

$$\begin{array}{lccccccc} VR = & 0.301 & - & 0.096P_C & - & 0.009F & - & 0.013G & - & 0.005AGE \\ & (3.67)* & & (1.42)* & & (1.23) & & (1.72)* & & (2.80)* \end{array}$$

$$\begin{array}{ccccc} + & 0.084UR & + & 0.103IM & \\ & (1.20) & & (2.76)* & \end{array}$$

where IM is a dummy variable for Iles de la Madeleine. The dummy variable for Gaspe is not statistically significant, implying that the supply of offences equations in Gaspe and the Northshore are basically similar; it was therefore dropped from the equation. All estimated coefficients have the expected signs, again reinforcing the deterrence hypothesis and the economic model of criminal behaviour. An increase in the probability of conviction by one percentage point will reduce the violation rate by .096 of a percentage point (i.e., by .00096). On the other hand, since F is measured in units of one hundred dollars, a hundred dollar increase in the average fine is predicted to reduce the violation rate by .009, which is almost one percentage point. In the Gaspe, a percentage point reduction in the violation rate represents a 10% reduction in total violations, while on the Northshore it is a 7% reduction. However, on Iles de la Madeleine, the same hundred dollar increase in fines would cut total violations in groundfish I in half. The hundred dollar increase in fines would constitute a 44% increase in the perceived fine in Gaspe, a 56% increase in Iles de la Madeleine, and a 29% increase on the Northshore.

The 16 shrimp interviews for closed area violations are combined with the 13 Gaspe and the 15 Iles de la Madeleine interviews of groundfish II (mobile

[11]The mean of the dependent variable is .087, and the unadjusted R^2 for this equation is .27.

gear, less than 65") for illegal nets, to form a single sample of 44 observations. Again, dummy variables are constructed to account for structural differences between the shrimp and groundfish II industries, and between Gaspe and Iles de la Madeleine. The following supply of offences is estimated for this sample.

$$VR = \underset{(3.18)*}{0.186} - \underset{(3.82)*}{0.094P_C} - \underset{(1.27)}{0.0014F} + \underset{(0.31)}{0.027IGS} - \underset{(1.29)*}{0.001AGE}$$

$$- \underset{(0.54)}{0.025CON} + \underset{(0.78)}{0.036UR} - \underset{(2.57)*}{0.161INC} + \underset{(4.58)*}{0.121GP} + \underset{(1.33)*}{0.047S}$$

where the new variables are

IGS = the illegal gain share
S = a dummy variable for the shrimp industry.

The gain variable employed in the three previous samples does not perform well here. The reason may be that although a given dollar gain is substantial in the groundfish industry, it represents a negligible proportion of total catch in the shrimp fishery. The illegal gain share is the percentage by which a violation increases total catch; it avoids the scaling problem between the shrimp and groundfish II industries. The coefficient for IGS is positive as hypothesized, but not statistically significant.

The dummy variables for the Gaspe and shrimp fisheries each exhibit positive and statistically significant coefficients. Thus, the structure of the violations response function in these fisheries shifts upward relative to the Iles de la Madeleine fishery. The coefficient for the variable representing previous convictions has changed signs relative to previous estimates, but is not statistically significant.

The coefficient of the probability of conviction is negative and significant at the 99% confidence level. The coefficient for fines is also negative, and exhibits a level of confidence of about 85%. One percentage point increase in the probability of conviction is predicted to decrease the average violation rate by .00094. Recall from the previous section that the violation rates in the shrimp and Iles de la Madeleine fisheries are remarkably low: the mean violation rate for this entire sample is .040. Therefore, the above deterrent effect represents a 2.4% decrease in violations. If fines in these

fisheries were increased by one hundred dollars, the violation rate is estimated to decrease by .0014; this is a 3.5% deterrent effect.

In summary, the results of this section provide strong support for the economic model of criminal behaviour. All of the explanatory variables display the hypothesized effects on violation rates, and tend to be statistically significant. The underlying assumption, that individuals rationally decide to violate a fisheries' regulation by implicitly weighing the costs against the benefits, cannot be rejected. The commission of illegality in the fishery can be effectively controlled by altering the associated gains and losses. It is unfortunate that all of the policy instruments could not be included in each of the estimated equations (the effect of sample size on multicollinearity prohibits this). However, some insight has been gained into the relative magnitudes of the deterrent effects of the likelihood and the severity of punishment in these fisheries.

5.0 CONCLUSION

We believe the methodology described in this paper can be an effective tool for evaluating the deterrent effect of fisheries law enforcement. This belief has developed over the course of three studies involving five regions of the Department of Fisheries and Oceans in Canada. The results of these deterrence studies along with analyses of enforcement effort and other data collection and analysis have influenced program delivery through the recommendations of the evaluation studies that summarized their findings. We hope other jurisdictions will consider this methodology if and when they decide to evaluate their enforcement programs. This paper has been intended to provide an introduction and to help others to benefit from some of the lessons we have learned.

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Appendix A

Examples of personal interview survey questionnaires used in Pacific, Atlantic, and Quebec Regions

Figure A.1: Personal Interview Questionnaire, Pacific Region

4. SEINERS: NET VIOLATIONS Area _____

1. How often does this occur? _____ % of sets

2. How much would an individual likely gain from this kind of violation?
   _____ % of catch $ _____

3. How often do Fisheries Officers check seiners for net violations?

   _____ % of sets

   How much of a deterrence is this ? _____

4. What percentage of violations are caught? _____ %

   How much of a deterrence is this? _____

5. What would likely be seized from someone who was caught? How much is it worth?

   _____ $ _____
   _____ $ _____
   _____ $ _____

6. Of those caught, how many would likely be prosecuted? _____ %

7. Of those prosecuted, how many would likely be convicted? _____ %

8. Of those convicted, how many would receive a suspended sentence? _____ %

9. If the sentence is not suspended, what would the penalty likely be?

   _____ $ _____
   _____ $ _____
   _____ $ _____

   How much of a deterrence is this penalty? _____

10. Other comments?

   _____
   _____
   _____

Figure A.2: Personal Interview Questionnaire, Atlantic Regions (cont'd)

11. Given these gains, probabilities of being caught and punished, and penalties, how often would an individual likely commit such a violation?
    _____ % (of time/sets/days)

12. What would be the likely gain over the course of the season?
    _____ % of annual catch $ _____

13. What would the level of the penalty have to be to create an adequate deterrence effect?
    $ _____

    Now think about these violations over an entire season and for everyone involved.

14. What percentage of vessels would likely commit such a violation at least once?
    _____ %

15. How often does such a violation occur?
    _____ % (of hauls)

16. What percentage of the total annual catch is attributable to this violation?
    _____ %

17. What would the total annual catch be if no one committed this violation?
    _____ %

18. Other comments?

    _____

    _____

    _____

Figure A.2: Personal Interview Questionnaire, Atlantic Regions

7) DOMESTIC OFFSHORE TRAWLERS (100 FT) NET VIOLATIONS

Region/Zone _____

1. How much would a vessel likely gain from one violation of this kind? (i.e.: 1 haul)
   $ _____

2. What is the probability of being caught by a fishery officer?
   _____ %

3. Of those caught, how many would likely be prosecuted? _____ %

4. Of those prosecuted, how many would likely be convicted? _____ %

5. Of those convicted, how many would receive a suspended sentence? _____ %

6. If the sentence is not suspended, what would the penalty likely be?
   _____ $ _____
   _____ $ _____
   _____ $ _____

7. Are you aware of the policy which the Minister of Fisheries has announced on licence suspections and forfeitures?
   No _____ Yes _____
   (If yes) If convicted, how likely is it that a ministeral licence suspension would be applied? 1st offence _____ %
   2nd offence _____ %

8. For how long would the suspension be? _____ weeks
   What would the dollar value of such a suspension likely be $ _____

9. If convicted, how likely is it that the Minister would order the forfeiture of gear, vehicles, etc? _____?

10. What would be the dollar value of such a forfeiture? $ _____

Figure A.3: Personal Interview Questionnaire, Quebec Region

QUESTIONNAIRE

Species _____
Offence: 1st Type _____
2nd Type _____
Sector _____

1. What % of the total catch in your area is taken by individuals who don't have a licence to fish? _____ %

2. Out of 100 licenced vessels fishing this species, how many are committing this violation on a typical fishing day?
1st Type _____ 2nd Type _____

3. Out of 100 licenced vessels committing this violation, how many are likely to be caught?
1st Type _____ 2nd Type _____

4. Out of 100 licenced vessels caught committing this violation, how many are likely to be prosecuted?
1st Type _____ 2nd Type _____

5. Out of 100 prosecutions for this violation, how many are likely to be convicted?
1st Type _____ 2nd Type _____

6. Out of 100 convictions for this violation, how many are likely to receive a

	1st Type	2nd Type		1st Type	2nd Type	
fine	____	____	number $	____	____	dollar value
forfeiture of catch	____	____	number $	____	____	dollar value
forfeiture of gear	____	____	number $	____	____	dollar value

7. a) Are you aware of the Department's Policy on licence suspensions?
_____ yes _____ no

b) Out of 100 fishermen that are convicted of this offence, how many are likely to receive a licence suspension?

1st Type _____ number _____ weeks duration $ _____ dollar value of lost fishing time

Figure A.3: Personal Interview Questionnaire, Quebec Region (cont'd)

2nd Type _____ number _____ weeks duration $ _____ dollar value of lost fishing time

8. If a fishermen chose not to commit the violation:

   a) By what % would his catch be reduced?
   1st Type _____ % 2nd Type _____%

   b) By how many dollars would his income be reduced?
   1st Type $ _____ 2nd Type $ _____

9. Out of a 100 fishermen who fish for this species, how many would make a practice of misreporting in their fishing log book? _____
(This question doesn't apply to lobster fishermen or those groundfish fishermen with boats less than 45 feet in length).

10. For how many days a year would a fisherman typically be fishing for this species? _____ days

11. Do you mind telling me your age? _____ yrs

12. Including yourself, how many family members do you have living at home? _____

13. Including yourself, how many members of your household work in the fishery? _____

14. How many members of your household are unemployed at the present time? ____

15. About what % of your household income is earned in the fishery? _____ %

16. Have you ever been convicted of a fisheries related offence? _____ yes _____ no

If yes. Elaborate

_____

_____

_____

_____

FISHERIES LAW ENFORCEMENT AND TRANSFERABLE INDIVIDUAL QUOTAS: A TENTATIVE ANALYSIS

by

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Fisheries Law Enforcement and Transferable Individual Quotas: A Tentative Analysis

by

Peder Andersen

Abstract

Some previous work in law enforcement show that imperfect enforcement of laws changes firms' behavior and that enforcement costs influence optimal policies. In this paper it is analyzed how imperfect, costly enforcement of fisheries law changes fishing firms' behavior and optimal management policies if a fishery is regulated by transferable fishing quotas. The main result is that the use of transferable quotas instead of non-transferable quotas changes the fishing firms' behavior, may change the enforcement cost function and if so an adjustment of the optimal policy is necessary.

1. Introduction

The history of several fisheries around the world shows us that open access to fish resources implies nonoptimal resource allocation and depleted stocks. In economic theory it is also demonstrated that common property rights result in externalities and that optimal exploitation can be obtained only through regulation. However, very often it is assumed that enforcement of the regulation is perfect and costless. But as pointed out by Cheung (1970), Demsetz (1967), Eckert (1979) and others, enforcement costs may play an important role in determining type and level of regulation.

In a recent paper by Sutinen & Andersen (1985) a formal model of fisheries law enforcement is developed to show how fishing firms behave and optimal policies are affected by costly, imperfect enforcement of fisheries law. The principal result is that the optimal steady-state stock size for costly, imperfect enforcement lies between the smaller open access stock size and the larger optimal stock size where enforcement is assumed costless and perfect. However, the model examines only non-transferable quotas. In this paper the model is extended to include transferable quotas. The basic elements in the model are drawn from the theory of the firm, standard bioeconomic theory[1] and the economic theory of crime and punishment.[2]

The paper is organized as follows. In the next section it is analyzed how fishing firms behave under imperfect law enforcement and section 3 describes the market for fishing quotas. In section 4 the enforcement cost function is defined and properties of the function are discussed. Finally, section 5 contains the analyses of optimal policy.

2. The Behavior of the Fishing Firm under Imperfect Law Enforcement

Let us assume that a fishing firm has received an individual quota of $\bar{q}_i$ units in a single species fishery but is able to buy or sell quota units. $\hat{q}_i$ denotes the units of transferred quotas so $\hat{q}_i > 0$ indicates that the fishing firm has bought quotas and $\hat{q}_i > 0$ that some quotas have been sold. The amount of the firm's catch above $q_i - (\bar{q}_i + \hat{q}_i)$ is therefore illegal. q_i is the present catch.

As the enforcement is imperfect not all violations are detected and convicted but if detection takes place a penalty fee is imposed on the firm. To simplify the analysis we assume the following penalty function

$$f = f(q_i - (\bar{q}_i + \hat{q}_i)) \tag{1}$$

where

$$f \begin{cases} > 0, \text{ if } q_i > \bar{q}_i + \hat{q}_i \\ = 0, \text{ otherwise} \end{cases} \tag{2.1}$$

$$\frac{\partial f}{\partial q} = f_q \geq 0, \quad \frac{\partial^2 f}{\partial q^2} = f_{qq} \geq 0, \quad q_i > \bar{q}_i + \hat{q}_i \tag{2.2}$$

Furthermore, we assume $f(\cdot)$ is continuous and differentiable for all $q_i > \bar{q}_i + \hat{q}_i$ but allow for discontinuity at $q_i = \bar{q}_i + \hat{q}_i$. We assume $f(\cdot)$ is given and we do not discuss the optimal structure of $f(\cdot)$.[3]

If a fishing firm is detected and convicted for quota violation the profits will be $\pi^i(q_i,x) - \hat{p}\cdot\hat{q}_i - f(q_i-(\bar{q}_i+\hat{q}_i))$ and if not $\pi^i(q_i,x)-\hat{p}\cdot\hat{q}_i$, where $\hat{p}$ is the price of a quota unit and $\pi^i(\cdot)$ is the firm's profits before penalties and purchasing quotas. The profit function $\pi^i(\cdot)$ is given by

$$(3) \quad \pi^i(q_i,x) = p\cdot q_i - c^i(q_i,x)$$

where $\pi^i_q > 0$ in the relevant range, $\pi^i_{qq} < 0$, $\pi^i_x > 0$, $\pi^i_{qx} > 0$, p is the price of fish, x is the stock size and $c^i(\cdot)$ is the cost function. We assume the firm takes the price of fish as well as the price of quotas as given and faces a known and constant probability of detection and conviction θ.

Assuming the firm is risk neutral and maximizes expected profits, the maximization problem is

$$(4) \quad \underset{q_i,\ \hat{q}_i}{\text{maximize}}\ \theta[\pi^i(q_i,x)-\hat{p}\cdot\hat{q}_i-f(q_i-(\bar{q}_i+\hat{q}_i))] + (1-\theta)[\pi^i(q_i,x)-\hat{p}\cdot\hat{q}_i]$$

The first-order conditions to (4) are

$$(5.1) \quad \pi^i_q(q_i,x) = \theta f_q(q_i-(\bar{q}_i+\hat{q}_i))$$

$$(5.2) \quad \hat{p} = \theta f_q(q_i-(\bar{q}_i+\hat{q}_i))$$

Eq. (5.1) indicates that for a given stock size, x, and a given quota, $\bar{q}_i+\hat{q}_i$, the firm sets its catch rate at q_i^1, in excess of its quota, where marginal profits equal the expected marginal penalty, see figure 1 for an illustration. Of course, if the probability θ is zero and/or no penalty exists, the firm would catch at q_i^o and furthermore, no incentive to buy quotas would exist either. The level of illegal catch depends on π_q^i, θf_q, $\bar{q}_i$, all exogenously given, and $\hat{q}_i$, where the level of $\hat{q}_i$ depends on the price of quotas, $\hat{p}$.

Eq. (5.2) gives the marginal conditions for buying quotas. As long as $\hat{p} < \theta f_q(\cdot) = \pi_q^o(\cdot)$ the fishing firm will buy more units of quotas. The demand function for quota units is derived in figure 2 for a specific set of functions. The demand function is the horizontal distance between the π_q^i curve and the θf_q curve. First of all, transferable quotas do not remove illegal catch but reduce the level of illegal catch for quota buyers. Secondly, the demand for quotas depends on the penalty function, the probability of detection and the market price for quotas.

For analytical reasons it is convenient to determine the firm's demand for quotas under the assumption that the initial level is zero, $\bar{q}_i^o = 0$. Aggregating for all firms this approach provides us with the total demand for quotas. Of course, the total exchange of quotas depends on the initial distribution of the total quota, $\bar{Q} = \sum_i \bar{q}_i$ across firms. The single firm will buy/sell according to $D_i(\hat{p}|\bar{q}_i^o=0)-\bar{q}_i$. If $D_i(\hat{p}|q_i^o = 0) < \bar{q}_i$ the firm will

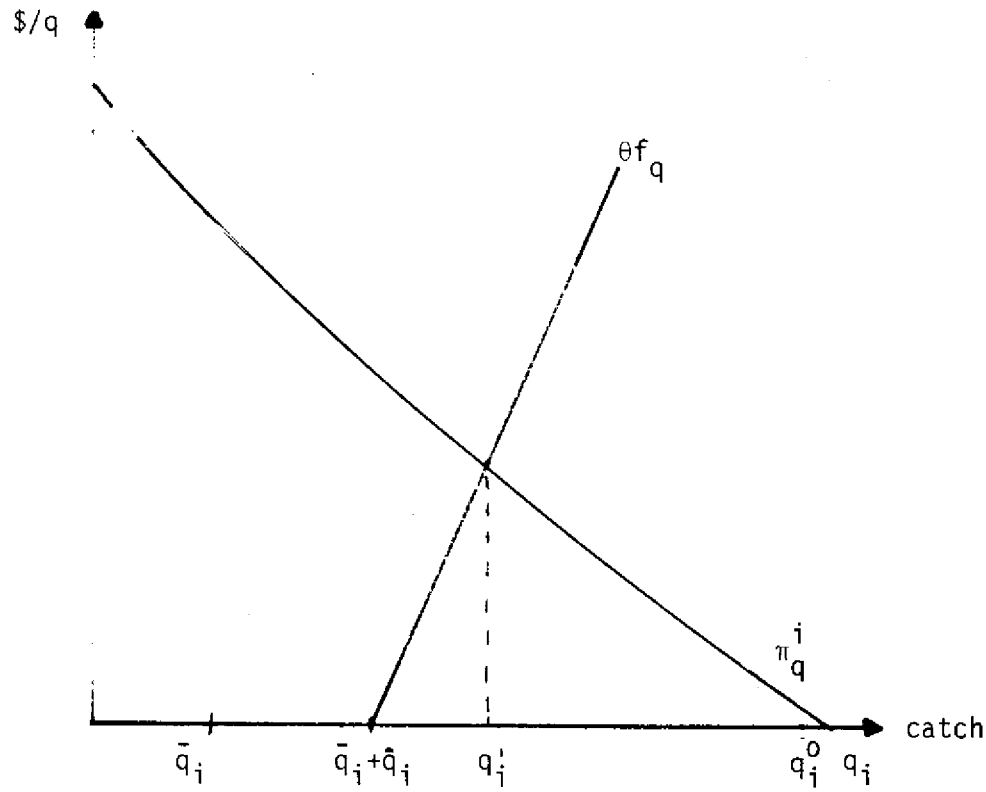

Figure 1.

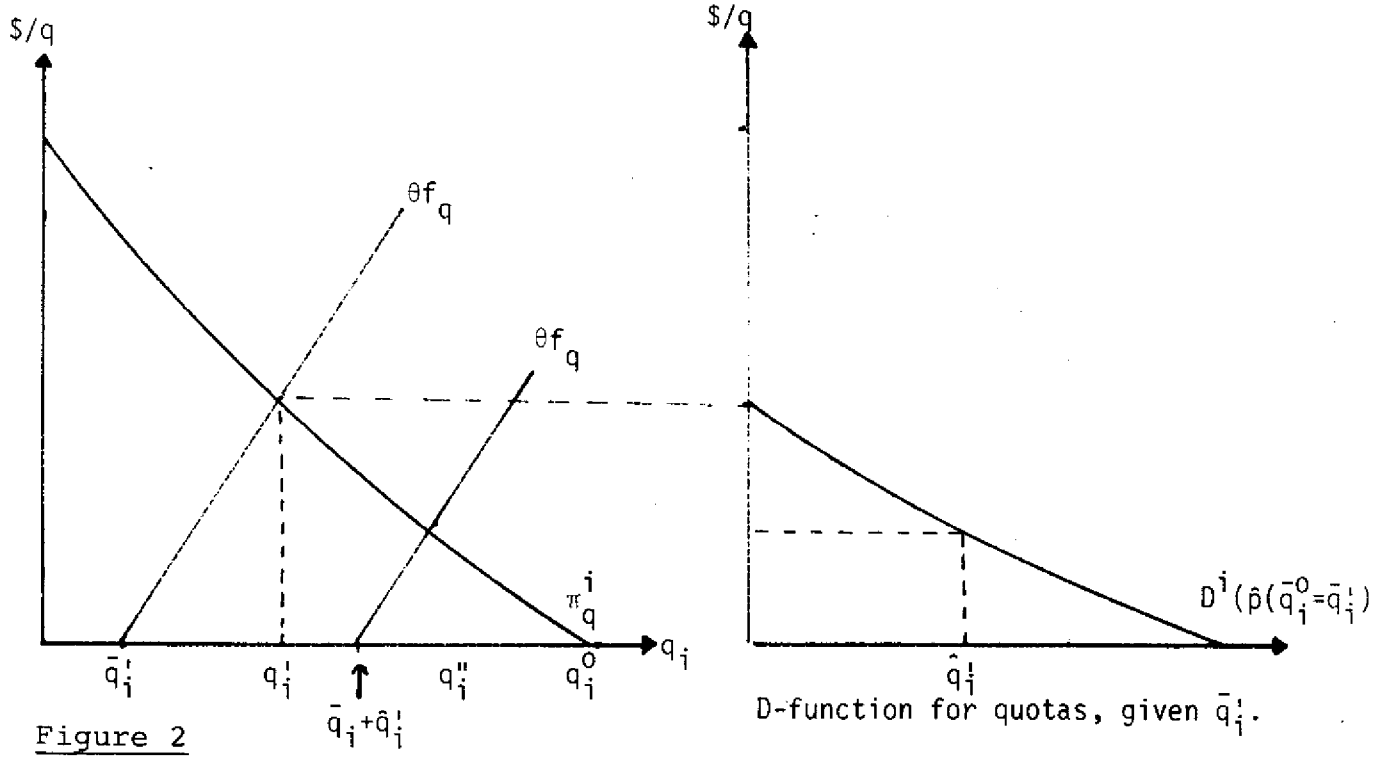

Figure 2

D-function for quotas, given $\bar{q}_i^1$.

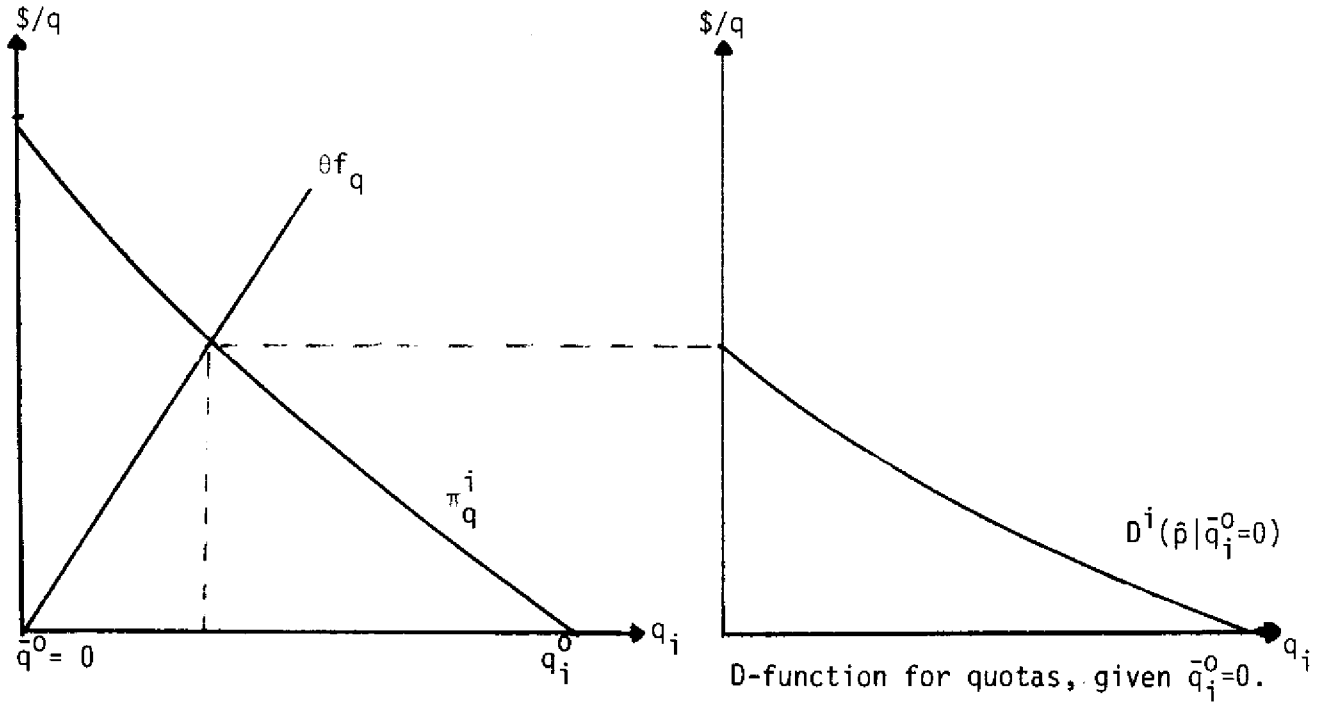

Figure 3

D-function for quotas, given $\bar{q}_i^o=0$.

sell quotas and buy if $D_i(\hat{p}|\bar{q}_i^o = 0) > \bar{q}_i$. In figure 3 the demand function $D_i(\cdot)$ is derived for a specific penalty function, $f(\cdot)$, and a given probability of detection, θ.

We are now in a position to derive a firm's catch rate by solving the first-order conditions in (5) and we get

$$(6) \quad q_i = q_i(\theta, x, \hat{p})$$

For simplicity we suppress other arguments such as the price of fish, production cost parameters and the parameters of the penalty function in (6). The properties of (6) important for the following analysis are $\partial q_i/\partial\theta<0$, $\partial q_i/\partial x > 0$ and $\hat{\partial} q_i/\partial p < 0$.[4] In other words, an increase in the probability of detection and conviction decreases a firm's catch rate as the expected marginal penalty schedule θf_q, becomes steeper. An increase in the stock size increases the marginal profit schedule, π_q^i and therefore increases a firm's catch rate. Finally, an increase in the price of quotas decreases a firm's catch rate as long as $D_i > 0$ as the D_i-function is downward sloping.

3. The Market for Fishing Quotas

In section 2 the individual demand functions for quotas $D_i(\hat{p})$ were derived. The total demand for quotas is the sum of the demand for all $\bar{N}$ vessels

$$(7) \quad D(\hat{p}, x|\bar{q}_i = 0, \theta = \bar{\theta}, f(\cdot) = \bar{f}(\cdot))$$

$$= \sum_{i=1}^{\bar{N}} D_i(\hat{p}, x|\bar{q}_i = 0, \theta = \bar{\theta}, f(\cdot) = \bar{f}(\cdot))$$

where we assume $\bar{N}$ is fixed and θ and $f(\cdot)$ are exogenous parameters. The properties of (7) are $\frac{\partial D}{\partial \hat{p}} < 0$, $\frac{\partial D}{\partial \theta} < 0$, and $\frac{\partial D}{\partial f} < 0$.

The total quota is

$$(8) \quad \bar{Q} = \sum_{i}^{\bar{N}} \bar{q}_i$$

which we assume fixed by the regulating authority.

As the supply of quotas is fixed at $\bar{Q}$ and Eq. (7) gives us the total demand, the market-clearing condition in a perfect competitive market for quotas is given by $D(\hat{p},x|\cdot) = \bar{Q}$ which determines a quota price $\hat{p}$ which depends on the stock level, x, the probabillity of detection θ, and the penalty function but not on the initial distribution of the total quotas as we ignore potential income effects. It is important to notice that if x, θ or f_q increase the price of quotas, $\hat{p}$, increases and if the total quota $\bar{Q}$ rises, $\hat{p}$ decreases. Beside the impact on allocation such changes affect the income distribution across firms.

As the price of quotas is endogenously determined we can set up the aggregate catch function for the whole fishery and we get the following

$$(9) \quad Q = Q(\theta,x,\bar{Q},f(\cdot))$$

We assume that (9) can be treated as continuous and that the inverse form exists. This becomes important in the following discussion.

4. Enforcement Costs in a Fishery with Transferable Quotas

The level of enforcement of the quota system depends on the amount of inputs such as aircraft, patrol boats, observers, and

judicial personnel. Therefore, there is an enforcement cost function related to detecting and convicting activities. If, for political or other reasons, the penalty function is fixed the only way to reduce illegal catch is by increasing the probability of detecting and convicting violators. The probability θ depends on an input vector $\underline{k}$ i.e. $\theta = \theta(\underline{k})$ where $\partial\theta/\partial k_j > 0$ and $\partial^2\theta/\partial k_j^2 \leq 0$. Given the prices of inputs there exists an enforcement cost function, $e(\theta)$, where $\partial e/\partial\theta > 0$, $\partial^2 e/\partial\theta^2 \geq 0$ as we assume the least cost combination of k to obtain a given θ.

As we assume the existence of the inverse form of $Q = Q(\cdot)$ enforcement costs can be represented by

$$(10)\quad e(Q^{-1}(Q,x,\bar{Q})) = E(Q,x,\bar{Q})$$

where $\partial E/\partial Q < 0$, $\partial E/\partial x > 0$, and $\partial E/\partial\bar{Q} > 0$.[5] This means that if we allow an increase in catches for a given stock size and quota we are able to save enforcement costs and if we want to obtain a given catch level an increase in enforcement costs is required if the fish stock grows, and finally, increased enforcement costs are required to achieve a given catch level if the quota is relaxed.

It is important to note that if there is no upper bound on the penalty fee, f, and we want to minimize enforcement costs defined as in (10), it would be optimal to set an extremely high fee and a corresponding low θ. A low θ implies small enforcement costs. However, for political and social reasons there will be an upper bound on f and therefore large enforcement costs to achieve a given level of illegal catches.

It is also important to note that the size of the quota, $\bar{Q}$, plays an important role in the enforcement cost function. Furthermore, in (10) the allocation of the total quota $\bar{Q}$ among the $\bar{N}$ fishing firms is neglected but the allocation may be an important determinant in the enforcement cost function. This aspect becomes crucial as we are dealing with transferable quotas. The initial allocation will probably be different from the final allocation of quotas so the question is whether the market allocation of the quotas results in higher or lower enforcement costs than other allocations of the total quota, ceteris paribus.

The market allocation of quotas implies efficiency as to fishing activities as the initial allocation of the quotas will be reallocated according to the first-order conditions in (5). However, it is more difficult to determine if the enforcement costs will decrease or increase caused by the transferable quota system. From the analysis in section 2 it becomes clear that buyers of quotas reduce illegal catches but on the other hand sellers of quotas increase illegal catches. It is important to realize that the buyer of certain units of quota will reduce the illegal catch more than the seller if these are identical except the initial units of quota. In cases where the marginal profit function, π_q^i, is convex, the enforcement costs will decrease and it is apparently true in more general cases, too. But further investigation of this problem is necessary.

5. Optimal Policy

In the paper by Sutinen & Andersen (1985) it is shown how optimal management policies are affected by costly, imperfect en-

forcement under the assumption that the quota allocation is exogenously determined. Under the transferable quota regime the initial quota allocation is exogenously determined but the final allocation endogenously determined via the market for quotas. However, from the regulating authority's point of view the final allocation of quotas is exogenously determined as it is assumed that the regulating authority does not intervene in the quota market. This means that the analysis of optimal policy under a transferable quota regime more or less follows the analysis in Sutinen & Andersen (1985).

Optimal policies are based on the usual criterion of maximizing the discounted sum of net social benefits. Net social benefits in each period are given by

$$(11)\quad \int_0^Q p(s)ds - c(Q,x) - E(Q, \bar{Q}, a_Q^m)$$

where $p(Q)$ is the inverse demand function, $c(Q,x)$ is the aggregate catch cost function (with $c_Q > 0$ and $c_x < 0$) and $E(Q,x,\bar{Q},a_Q^m)$ is the enforcement cost function, where a_Q^m indicates the market allocation of the total quota. It is assumed that social benefits can be appropriately measured by the area under the ordinary demand curve. The aggregate cost function depends on the fixed set of quotas, and does not include penalty fees. Penalty fees are not included as we ignore distributional aspects.

The stock dynamics are assumed given by the standard differential equation

$$(12)\quad \dot{x} = h(x) - Q,$$

where $x = x(t)$, $Q = Q(t)$, and $h(x)$, the natural growth rate, is strictly concave.

Optimal policies are found by maximizing $\int_0^\infty [\int_0^Q p(s)ds - c(Q,x) - E(Q,x,\bar{Q},a_Q^m)]e^{-\delta t}dt$ subject to (12), where the social discount rate is represented by δ. The first-order conditions for this problem (assuming an interior solution) are

$$(13)\quad p - c_Q - E_Q - \lambda = 0,$$

$$(14)\quad \dot{\lambda} = c_x + E_x + \lambda(\delta - h_x),$$

where $\lambda = \lambda(t)$ is the dynamic multiplier.

Setting $\dot{\lambda} = 0$ and solving (13) and (14) yields

$$(15)\quad \delta - h_x = \frac{-(c_{x^+} + E_{x^+})}{p^+ - (c_Q^+ + E_Q^+)}$$

which together with (12) when $\dot{x} = 0$, determines the steady-state optimal stock size, x^+, the optimal catch rate, Q^+, and resulting price, p^+.

Assuming costless and perfect enforcement, i.e. where catch rates are perfectly controlled at zero cost, the condition for optimality is

$$(16)\quad \delta - h_{x^*} = \frac{-c_{x^*}}{p^* - c_{q^*}}$$

where x^* is the optimal stock size, q^* the optimal catch rate and

p^* the resulting price. By comparing (15) and (16) it can be shown (see the appendix) that the presence of costly, imperfect enforcement results in a smaller optimal stock size than otherwise, i.e. $x^+ < x^*$. Similarly, higher enforcement costs result in a lower optimal stock size.

The economic reasoning behind this result is as follows. At the open access equilibrium, i.e. with no enforcement, enforcement cost is nil. Moving the fishery away from the open access equilibrium towards a larger stock size increases enforcement costs and management benefits (net consumers and producers surplus). For the interior solution assumed here, marginal enforcement costs increase and marginal management benefits decrease as the steady-state stock size is increased. The optimal stock size, x^+, is where marginal management benefits equal marginal enforcement costs. With costless, perfect enforcement, the optimal stock size, x^*, is where marginal management benefits equal zero. Hence, the result $x^+ < x^*$.

If we compare the non-transferable quota regime to the transferable quota regime the result depends on the change in enforcement costs caused by the move from the non-transferable to the transferable quota regime. In section 4 this issue was discussed. If the enforcement costs are smaller in a fishery with transferable quota than in a fishery with non-transferable quota it follows directly from the equations (15) and (16), the appendix and the interpretation of the equations that smaller enforcement costs result in a higher optimal stock size, i.e. $x^* > x^+ > x^{**}$ where x^* is the stock size with no enforcement costs, x^+ is the stock size with enforcement costs and transferable quotas, x^{**} is the stock size with enforcement costs and non-transferable quotas. Of

course, if the enforcement costs are higher under a transferable quota regime we get the opposite result, i.e. $x^* > x^{**} > x^+$.

To compare catch rates under the non-transferable quota regime and under the transferable quota regime we need to specify whether the stock sizes are above or below the maximum sustainable yield (MSY) level.[6] For the case where $x^+ > x^{**}$ the results can be presented as follows:

$$(17.1) \quad x^{**} < x^+ < x_{MSY} \Rightarrow Q^{**} < Q^+$$

$$(17.2) \quad x_{MSY} < x^{**} < x^+ \Rightarrow Q^{**} > Q^+$$

$$(17.3) \quad x^{**} < x_{MSY} < x^+ \Rightarrow Q^{**} \gtrless Q^+$$

The main conclusion is that the catch rate under a transferable quota system is larger/smaller than under a non-transferable quota system if the MSY stock size is larger/smaller than the stock sizes under the two regimes. If the MSY level is between no clear cut answer can be given. Furthermore, if $x^{**} > x^+$, i.e. enforcement costs highest under the transferable quota systems we get the reverse results.

6. Concluding Remarks

The main purpose of this paper has been to extend the analysis in Sutinen & Andersen (1985) of the impact of costly, imperfect enforcement in a fishery with non-transferable quotas to the case with transferable quotas. The main conclusion is that the existence of a quota market changes the behavior of the fishing firms, may change the enforcement cost function and in that case the optimal management policy is affected.

An unsolved problem in the paper is the influence of a quota market on the enforcement cost function. As this is crucial more work has to be done on this matter. Also to be left for future work are the analyses of taxes, where collection is both costly and imperfect, and some formal analyses of the optimal enforcement system.

Footnotes

1. See Clark's excellent book on bioecoomics and Clark (1980) or Clark (1985) for a formal analysis of fisheries regulation. For an excellent non mathematical survey of the economic literature on fisheries repletion, see Scott (1979).
2. The classical article on the economic theory of crime and punishment by Becker (1968) has been the point of departure for more general analysis of law enforcement, see e.g. Stigler (1970) and Veljanovski (1983, 1984) and for analyses on enforcement of pollution control, see e.g. Brandley (1974) and Viscusi & Zeckhauser (1979).
3. See Stigler (1970) for an analysis of optimum enforcement of laws.
4. See Sutinen and Andersen (1985) for the formal derivation of the signs.
5. See Sutinen and Andersen (1985).
6. The maximum sustainable yield occurs at the stock size x_{MSY} where $h_x(x_{MSY}) = 0$.

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Appendix

This appendix is almost identical to the appendix in Sutinen & Andersen (1985). In this appendix the effects enforcement costs have on the fishery system are formally derived. For this purpose we use the Hamiltonian with a multiplicative shift parameter, φ, before the enforcement cost function:

$$H = \int_0^Q p(s)ds - c(Q,x) - \varphi E(Q,x) + \lambda[h(x) - Q]$$

where $\varphi = 0$ in the case of no enforcement costs and $\varphi = 1$ when enforcement costs are accounted for. As $\bar{Q}$ and a_Q^m are exogenous, they are not included in the functions. The first-order conditions in the steady-state equilibrium are

$$p - c_Q - \varphi E_Q - \lambda = 0 \qquad (A.1)$$

$$\dot{\lambda} = \delta\lambda + c_x + \varphi E_x - \lambda h_x = 0 \qquad (A.2)$$

$$\dot{x} = h(x) - Q = 0 \qquad (A.3)$$

Totally differentiating (A.1-3) with respect to φ yields the system of equations

$$[D] \begin{bmatrix} dQ/d\varphi \\ dx/d\varphi \\ d\lambda/d\varphi \end{bmatrix} = \begin{bmatrix} E_Q \\ -E_x \\ 0 \end{bmatrix}$$

where

$$[D] = \begin{bmatrix} (p_Q - c_{QQ} - \varphi E_{QQ}) & (c_{Qx} + \varphi E_{Qx}) & (-1) \\ (c_{Qx} + \varphi E_{Qx}) & (c_{xx} + \varphi E_{xx} - h_{xx}) & (\delta - h_x) \\ (-1) & (h_x) & 0 \end{bmatrix}$$

The sufficiency condition that H be concave requires $|D| < 0$. Solving this system then yields

$$\frac{dx}{d\varphi} < 0 \text{ and } \frac{dQ}{d\varphi} \gtrless 0 \text{ as } h_x \gtrless 0.$$

The results hold for all values of φ. Therefore, the effects of both the presence and an increase in enforcement costs are the same.

WORKSHOP ON FISHERIES LAW ENFORCEMENT

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