THE SCOTIA-FUNDY GROUNDFISH FISHERY: AN ECONOMIC VIEW

by

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ABSTRACT

A fishery is a common property resource. Without supply management policies, deployment of present day fish harvesting technology will lead to the overexploitation and eventual depletion of fish stocks. The Atlantic groundfish fishery has been the object of fisheries management policies since the 1960s, but with little apparent success in overcoming the problems associated with an open access fishery. The purpose of this thesis is to examine a particular division of this fishery, the Scotia-Fundy groundfish fishery, in terms of its management plans and policies.

To this end, a recent Department of Fisheries and Oceans management plan was chosen for study and its recommendations were analysed in terms of their potential for eliminating the supply management problems facing this fishery. Essential to this analysis is an understanding of the underlying fish population comparative statics model, which portrays the interrelationships between the fishermen and the stock.

The findings of the study indicate that a system of individual quotas has the potential to alleviate most of the negative effects that have resulted from past management policies and bring stability to the groundfish fishery as a whole. Critical to achieving this end is the introduction of an accompanying program of quota enforcement and catch monitoring. If these measures were successfully introduced,

the continued economic viability of the fishery would be a realizable objective.

INTRODUCTION

The subject of fisheries economics is a comparatively new area in the study of economics. The foundation article in this field was Scott Gordon's, "The Theory of a Common Property Resource: The Fishery," published in 1954. In this article Gordon emphasised the common property characteristic of the fishery and concluded that because of this, the resource will yield no economic rent. Participants will continue to enter the fishery until the open access, total revenue equals total cost, equilibrium results.

This work inspired many studies which focused on the efficient allocation of resources in the fishery. However, a number of these studies have been done from the point of view of conserving and preserving the fish stocks, resulting in this being the basis for many of the management plans and policies that have been developed. While conservation of the stocks is important, it is also necessary to look at the industry from the fishermen's point of view, for they count on the fishery for their livelihood. An efficient and effective management plan is one that, while developing regulations to conserve and preserve the stocks, will permit the fishermen to exploit the resource at the optimal level.

The purpose of this thesis is to examine the management plans and policies of an Atlantic fishery. The particular fishery chosen for this study is the Scotia-Fundy groundfish fishery, a fishery of great importance to the region but one currently facing serious management problems . A comprehensive management review plan for the Scotia-Fundy groundfish fishery was published in 1989 by the Department of Fisheries and Oceans. This plan, the Report of the Scotia-Fundy Groundfish Task Force, attempts to provide a solution to the serious decrease in fish stocks that has resulted from overfishing in this region. The recommendations proposed by the Task Force will be the focus of this study.

Before the problems facing the Scotia-Fundy region and the proposed solutions of the Task Force can be looked at, an understanding of the relationship between the groundfish stocks, fishing effort and catch over time is essential. This will be the focus of Chapter I.

The Scotia-Fundy groundfish fishery is part of a much larger industry, the Atlantic groundfish industry. The purpose of Chapter II is to trace the history of the groundfish industry in the Atlantic region to show the sequence of events leading up to the problems facing the fishery in the early 1990s.

Chapters III and IV will focus on the Report of the Scotia-Fundy Groundfish Task Force, giving a summary and an analysis of the Report's recommendations.

In Chapter V the concluding remarks will be presented.

CHAPTER I

REVIEW OF THE FISHERIES LITERATURE

Some Biological Aspects of Fisheries Economics

The fishing industry plays an important role in the economy of various regions in Atlantic Canada. It has however been facing serious economic problems in recent years. Most of these troubles relate to the overexploitation of fish stocks, causing many experts to wonder how many fish are actually left in the ocean. It is now important to effectively determine the amount of fishing that can take place without depleting fish stocks to dangerously low levels. These issues must be examined fully before new fisheries management policies, quotas and guidelines can be established.

Before the relationship between fishing effort and decreasing stock sizes can be examined it is necessary to have some knowledge of fish population dynamics and to review some of the relevant literature on fisheries economics.[1] At this point, the definition of fishing effort should be clarified in that it "measures the number of boats, traps, their catching power, their spacial distribution, the time spent fishing, the skill of the crew, etc".[2] In terms of the fishing industry,

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[1]The analysis which follows will be a static bioeconomic analysis. There are many dynamic models which deal with the subject of fisheries economics, but they are beyond the scope of this thesis. For more information see V. L. Smith, "On Models of Commercial Fishing," The Journal of Political Economy 77 (1969): 181-198.

[2]Lee G. Anderson, The Economics of Fisheries Management (Baltimore: Johns Hopkins University Press, 1986), p. 19.

the production function shows the relationship between the fishing effort applied and the size of the catch (in weight not numbers). The short run production function shows the relationship between catch and effort for a given population level, while the production function over the long run shows the relationship of effort and catch that can be maintained at a constant level year after year without affecting the net stock level. Because of the important interdependences among fishing effort, fish stock and catch, these relationships will be explored in some detail.

The depletion of fish stocks stems from the fact that fisheries are characterized as being common property resources, meaning that in the absence of management regulations to control entry, they are shared by all. In a free access fishing industry there is no limit on the number of fishermen that can take part, due to the fact that there are no restraints on entry. As long as there is a profit to be made, fishermen will continue to enter the fishery. These fishermen are always competing with each other for the best and largest catches; whatever fish one leaves behind will be caught by the next fisherman to come along. This results in excess amounts of labor and capital being applied to the fishing industry.

A fish stock that is unexploited or not yet subject to any amount of fishing will, at low population levels, increase slowly at first, but as the population begins to expand and grow the stock's increase per unit of time will accelerate. After this continues for some time[3] the carrying capacity of the environment will be reached, and the stock's rate of growth will slow down and reach a natural equilibrium. There are many environmental factors which will have an effect on this level of equilibrium, including available food supplies, prevailing currents, numbers of predators, salinity and temperature.[4] Assuming that these factors remain constant, the growth of the fishery can be shown by an S-shaped curve, as in Figure 1.

The fish population will increase slowly at first due to the fact that a small population has limited reproductive capabilities. When the stock of fish is small, any changes in its size will continue to be positive as long as its rate of growth is greater than its rate of natural mortality. The stock of fish will increase more rapidly in an intermediate range, as large numbers of fish are producing vast amounts of eggs. A point will be reached when the rate of growth will begin to decline and mortality rates rise due to decreases in food supplies and crowding. When these two forces balance each other the equilibrium population will be maintained. Any growth that occurs after this point will be negative, meaning that the fish stock will decrease in size.

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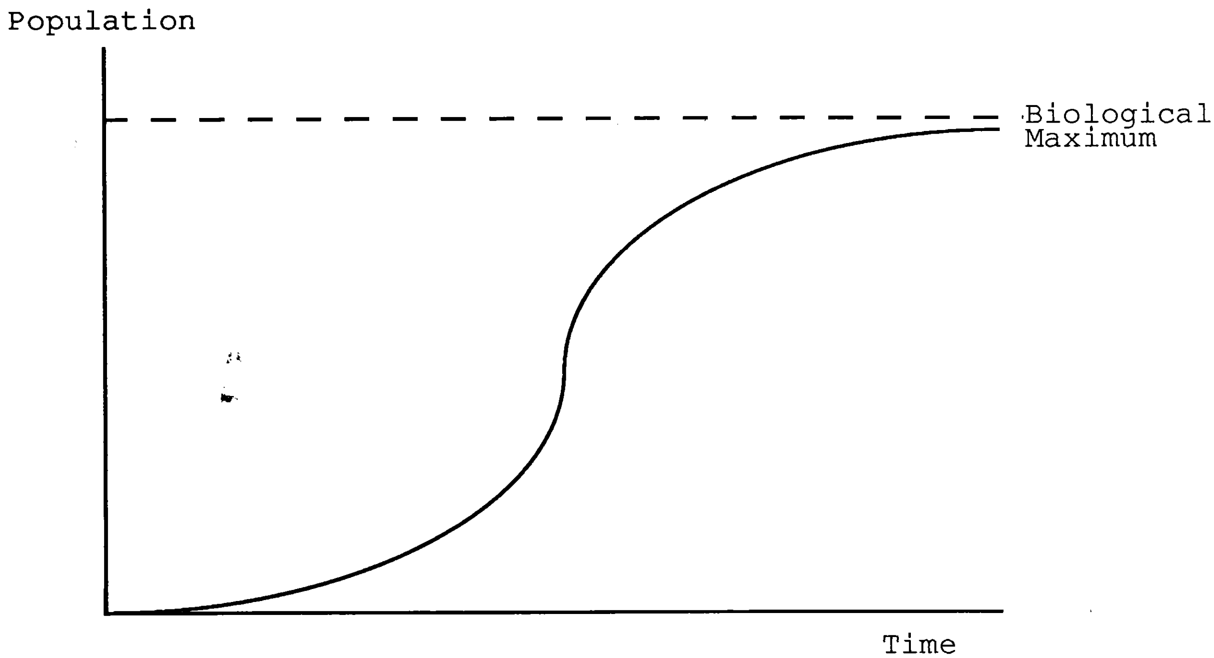
[3]The actual time interval involved will vary from one species to another.

[4]Anderson, p. 20.

Figure 1

Growth of a Fishery



Many models used in the past to study fish stocks and the causes of their depletion have been based on these patterns of population growth. The general notion behind these theories is that the biomass (B) of a population will tend to increase until it has reached the limits of the carrying capacity of the environment.[5] As a result, the rate of increase in the population can be shown by:

$$\frac{dB}{dt} = f(B)$$

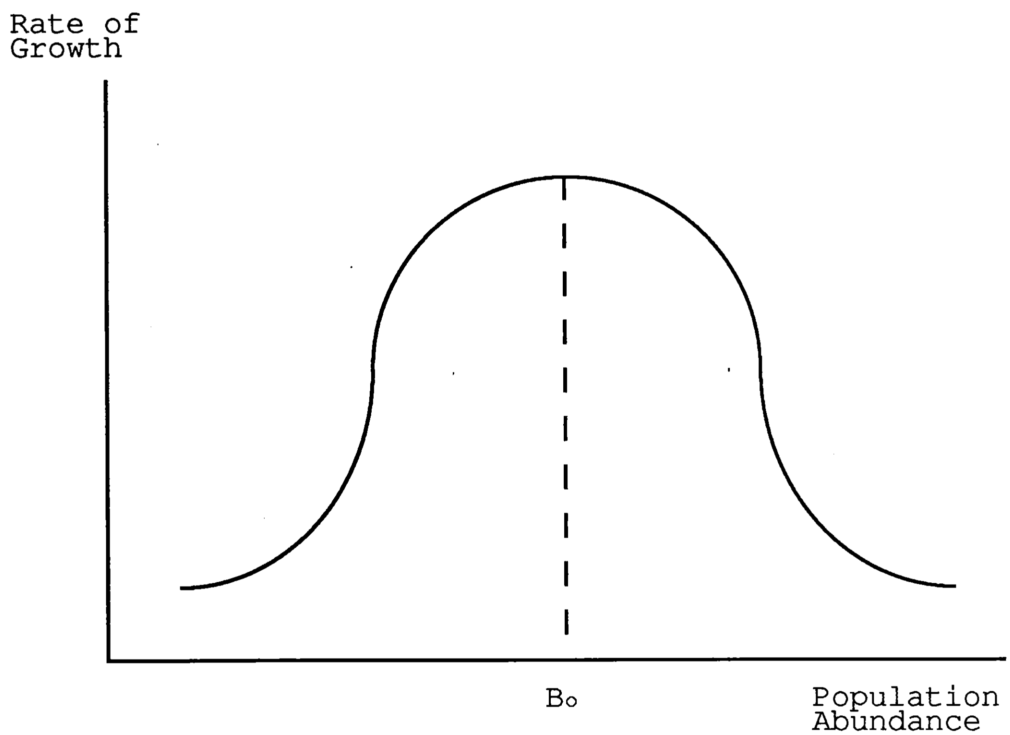
This explains the fact that the growth rate will be zero when the population is at the equilibrium level, B_0, since the

[5]Stephen Maurice Tugwell, Production and Efficiency in the Maritime Lobster Fishery (Kingston, Ontario: Queen's University, 1974) pp. 9-12.

population is stable at that point. It will also be zero when the stock size equals zero. For stock sizes between zero and B_0, the increase in the population will be positive. Taking all of this into account, it is possible to show that the growth of an unexploited fish stock can be represented by a bell shaped curve, shown in Figure 2.

Figure 2

Growth of an Unexploited Fish Stock

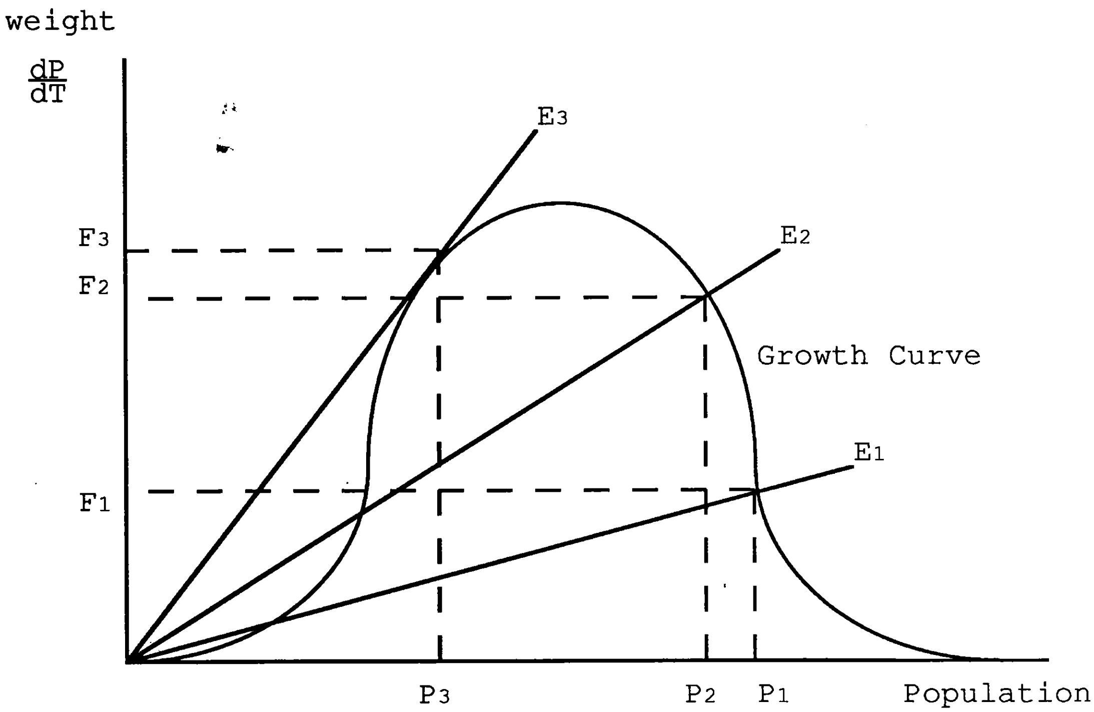


When the effects of fishing are added to the model, this point of natural equilibrium will be disturbed. The size of the stock will initially fall by the amount of the catch. Because of this reduction in the size of the stock, the population will be smaller than the carrying capacity of the environment rate would allow. As a result, the population will rise, and this cycle will continue until a new equilibrium is reached at the point where the decrease in stock as a result of fishing is equal to the natural growth of the stock. It is logical to assume that in the short run the greater the fishing effort applied to a particular fish stock, the larger will be the catch. Because of this relationship, a different equilibrium population size will result with each level of fishing effort applied. It can be concluded that there is an inverse relationship between fishing effort, or catch per unit of effort, and equilibrium population size, and it is the magnitude of this relationship that is of interest.

This relationship is portrayed in Figure 3, where the dotted lines represent the amount of fishing effort that has been applied to the industry at a certain population of fish. For example, if E_1 units of fishing effort are applied to the industry, the population will come to equilibrium at F_1. At population sizes greater than this amount, the growth of the stock will not be as large as the catch so the population will decrease. At lower levels of population, the rate of growth will be larger than the catch so the fish stock will increase. Equilibrium will occur at the point where the amount of the catch is just equal to the rate of growth of the population; this point is shown by P_1. If the amount of effort were to change, however, this equilibrium would be disrupted. For example, if the amount of fishing effort increased to E_2, then the equilibrium population would fall to P_2.

<u>Figure 3</u>

Population Equilibrium Analysis



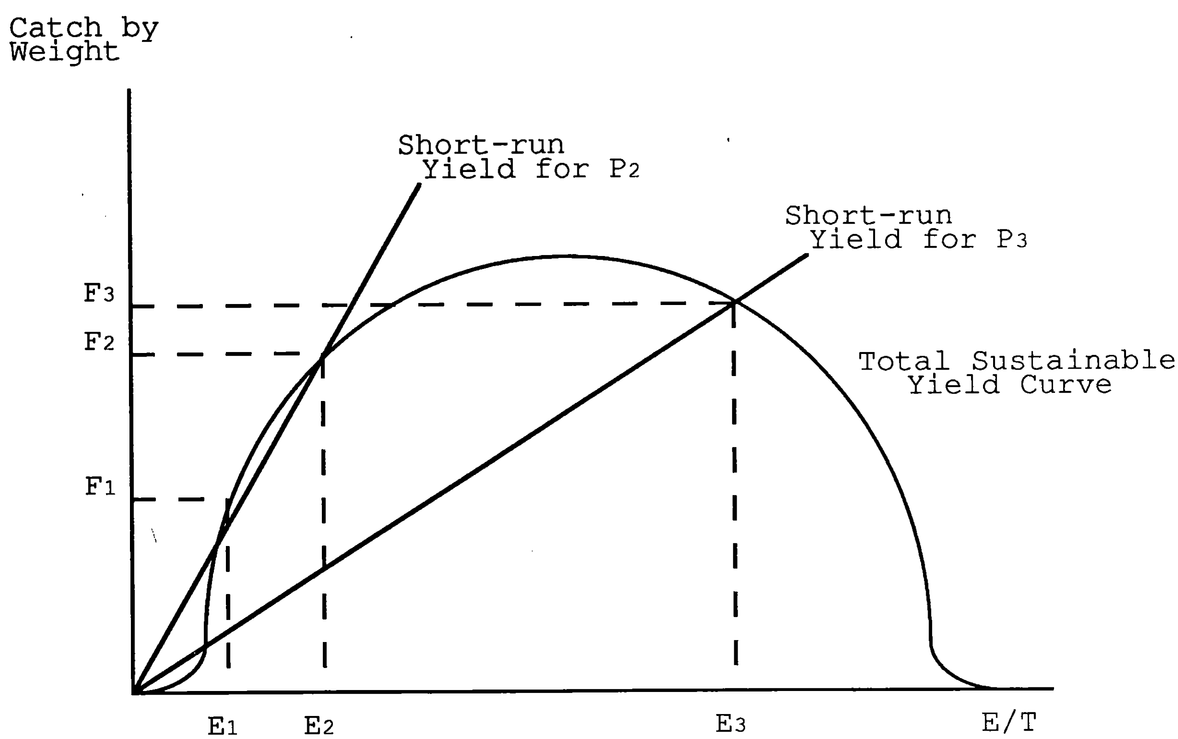
Source: Lee Anderson, 1986, p. 21.

The catch that is obtained at each level of effort and population is called the sustained yield. This is the case because over the long run the population size will remain unchanged, since the catch will always be replaced by the natural increase of the stock. This means that as long as the level of fishing effort remains constant, the same catch will be obtained year after year. This relationship is portrayed in the sustained yield curve, shown in Figure 4.

As the fishing effort applied in a particular fishery increases, the sustainable catch will at first rise reaching a maximum, but will then fall after this point. For example, as the effort increases from E_1 to E_2 the equilibrium level of population will decrease. At the same time, this fall in population will allow the natural growth of the stock to increase. As a result, the sustainable yield obtained will rise from F_1 to F_2. If on the other hand, effort is expanded

Figure 4

The Sustainable Yield Curve



Source: Lee Anderson, 1986, p. 24.

to E_3, the fish stocks will be reduced so much that the natural growth of the population will decrease, and the sustainable yield will fall. The turning point on the sustainable yield curve is known as the maximum sustainable yield (MSY), showing the largest quantities of fish that can be taken over the long run without depleting fish stocks any further. The MSY is important when trying to develop new management policies and programs to deal with the problems of depleting fish stocks.

At this point there is some disagreement among theories. Some analysts assume that if the fishing effort expands far enough, the sustainable yield will fall to zero as the entire population of fish is destroyed.[6] On the other hand, others claim that the decline in fish stocks due to overfishing will only drop to a certain level. At this point, the catches that can be taken will decrease, allowing the population to again reach an equilibrium position.[7]

Basic Economic Model of the Fishery

The model used by Gordon and Anderson attempted to explain the situation in an unregulated fishing industry, where the resource itself yields no economic return and there are many small boats exploiting the industry. Using the sustained yield curve and the assumption that the price of fish and the cost of

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[6]Anderson, p. 24.

[7]J. A. Gulland, The Management of Marine Fisheries (Seattle: University of Washington Press, 1974) p. 208.

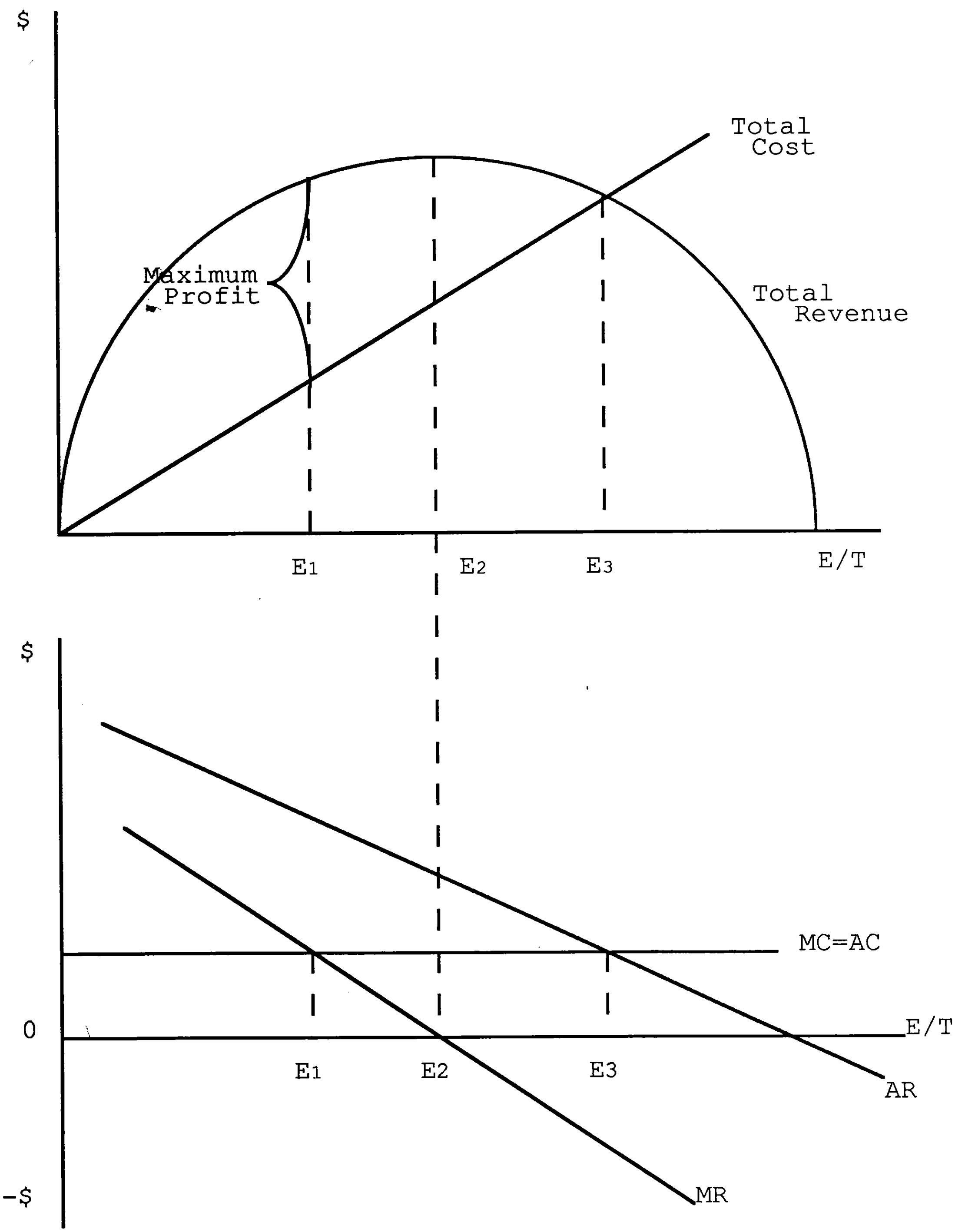
fishing effort remains constant, the long run relationship between total revenue and total cost for the industry can be pictured as in Figure 5.

When there is no regulation involved in the fishing industry, the equilibrium level of effort in the fishery will be shown by E_3, where total revenue and total cost are the same. If the fishing effort applied increases above this point, total costs will be greater than total revenue, and losses will result. Each fishing vessel will adjust by reducing its effort and some may even leave the industry. On the other hand, if effort fell to a level smaller than E_3, total revenue will be greater than total cost, resulting in profits. This means that fishermen will expand their efforts and new boats will enter the industry. Equilibrium will be maintained at the point E_3, called the open-access equilibrium yield.

The curves AP and MP represent the average and marginal products of fishing effort. The relationship between them is the same as that between marginal revenue and average revenue, and the two are used interchangeably. Looking at the diagram, the marginal revenue curve shows the change in revenue resulting from a change in effort, and is downward sloping due to the fact that the marginal catch per unit unit effort decreases as the fishing effort increases. At the.same time, the average revenue curve shows the revenue per unit at each

Figure 5

Open Access and Maximum Economic Yield



Source: Lee Anderson, 1986, p. 28.

level of effort, and is downward sloping for the reasons already described. The total revenue curve is shaped just like the sustained yield curve due to the assumption that the price of fish remains constant, showing that total revenue varies directly with the size of the catch.

Since the costs of fishing, supplies, gear, etc., are assumed to be independent of fishing effort, the marginal and average cost curves are shown to be identical and constant. This indicates that as long as all boats and vessels operating in the industry remain efficient, each additional boat can be added to the industry at the same cost as the previous one. For this analysis it is also assumed that the industry cost is equal to the opportunity cost, even though this may not actually be the case. Many things including fuel, bait, supplies and gear could easily be put to use in another industry. In this case price is a good indication of opportunity cost. But this may not be the case with regard to the fishermen themselves. While many fishermen are capable and could easily find other jobs, many are isolated geographically and may not be equipped to find other types of work. This means that income levels for fishermen may be representative of their opportunity cost, or income that could be earned in other industries.

The sustained yield curve and the total cost curve for effort can be used to derive the supply curve for a particular fishery, which is backward bending in nature. The logic behind the shape of the curve, shown in Figure 6, is that since there are two levels of effort that can catch any sustainable yield except the maximum, there must be two levels of average costs for each of these. For example, the level of catch of E2 can be harvested at a cost of $18.00 and $14.00. As effort is added to the fishery, sustainable yield increases until the maximum is reached. At the same time, average cost is also increasing due to the diminishing marginal catch rate of effort. Once the maximum sustainable yield is reached, further increases in effort will reduce the amount of the catch, while the cost will continue to increase as more and more effort must be applied to obtain this catch.[8]

For the sake of illustration, consider a fishery that is initially at E1 at a cost of $7.00 per unit. At this output the market price, as determined by the demand curve, is $20.00. There will be an expansion of effort to E2 as fishermen take advantage of the profit. At this point average cost and price will both equal $18.00, so there will no longer be an incentive for fishermen to expand their effort further. E2 is now the open access equilibrium, and it occurs at the higher of the two possible costs.

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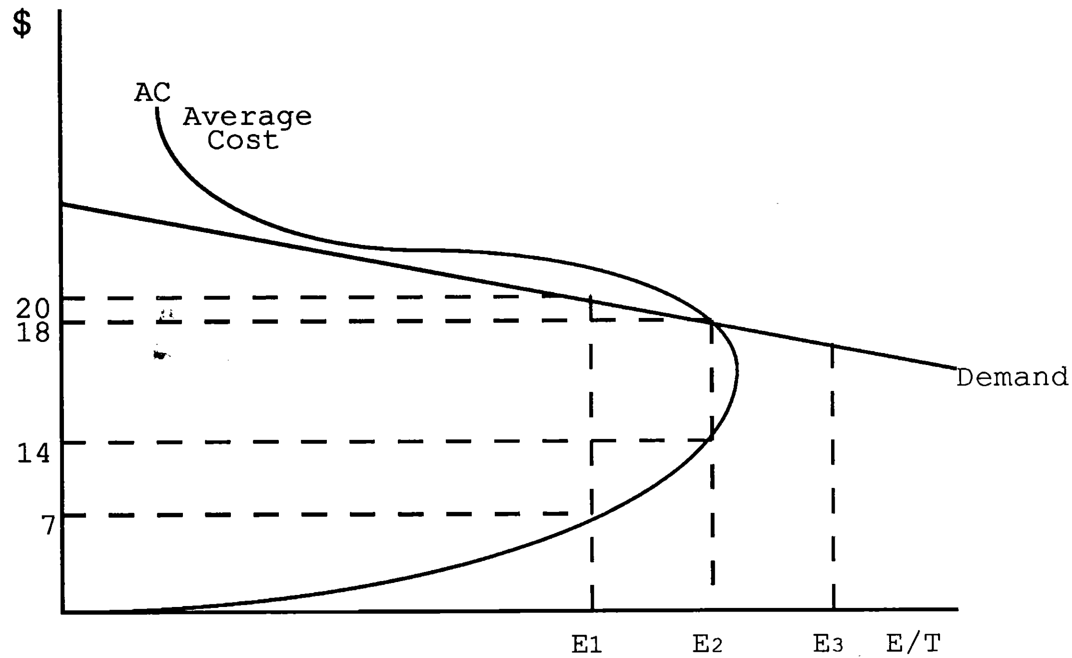
[8]Anderson, pp. 76-77.

Figure 6

Demand and Average Cost: Open Access



Source: Lee Anderson, 1986, p. 76.

The analysis to this point has centered on the open access nature of the fishery. In his article "The Theory of a Common Property Resource: The Fishery," Scott Gordon emphasised the common property characteristic of the fishery and concluded that because of this, the resource will yield no economic rent. As a result, overfishing will occur, and the open access equilibrium will occur where total revenue equals total cost, shown at E_3 in Figure 5. The optimal allocation of effort, on the other hand, will be achieved at E_1, a smaller level of effort than the open access equilibrium. At this point, the value to society of the last unit of fish caught just balances the cost necessary to provide it. In other words this is the point where marginal cost equals marginal revenue, and it is often called the maximum economic yield or MEY. When the marginal cost is greater than the marginal revenue, the additional fish are being taken at a cost that is greater than their value to consumers. This is shown by all points to the right of the optimal point E_1. To the left of E_1, revenues would be falling faster than costs.[9]

Because of the nature of the open access equilibrium, effective management will require some form of limited access regulation to prevent overfishing and the exploitation of fish stocks. There are many catch and effort limiting regulation possibilities which can be used, including quotas, gear and boat restrictions, and seasonal closures. Gear restrictions limit the kinds of fishing equipment or sizes of boats that can be used, while seasonal closures prevent fishermen from fishing in areas that are being overexploited. These controls on inputs are used to constrain fishing effort and the numbers of fish actually caught.

On the other hand, controls on output, which include quotas and landing taxes, bear directly on the catch itself. Taxes will have the effect of decreasing profits, thereby having the tendency to decrease effort. The main disadvantage of using this type of restriction arises from the fact that the tax may

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[9]Ibid., p. 33.

not be enough to deter fishing effort to the desired level. Quotas act as controls on output by allocating each fleet or vessel a specified harvest each year. The incentive is no longer to obtain the largest share of fish due to the fact that the quantity for each participant is now fixed. Under a quota system fishermen can focus on obtaining quality and high value catches instead of being concerned with quantity.

Chapter II

THE ATLANTIC GROUNDFISH INDUSTRY

History of the Atlantic Groundfish Fishery

The purpose of this chapter is to trace the history of the groundfish industry in the Atlantic region. This will show the sequence of events have led to the problems facing the fishery in the early 1990s.

Over the last forty to fifty years, the Atlantic fishing industry has faced many troubled as well as prosperous times.[1] Before World War II, the main countries that took advantage of the Atlantic waters consisted of France, Spain, Portugal, the United States and Canada (which included Newfoundland after 1949). Cod was the most important catch for these countries, although some Canadian and American fishermen found minor uses for haddock, pollock and hake. During this time, the hook and line method was prominent in the inshore fishery, but cod traps and nets were also used.[2] The steam powered trawler was

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[1]The discussion in this section draws heavily on: Navigating Troubled Waters: A New Policy for the Atlantic Fisheries, Michael J. L. Kirby, chairman (Ottawa: Canadian Government Publishing Center, 1983); and H.A. Regier, "Perspectives: Science for Canada's Shelf-Seas Fisheries," Journal of the Fisheries Research Board of Canada 32 (October 1975): 1887-1932.

[2]There are many fishing techniques used in the Atlantic Region. A cod trap is a net fence which leads the cod into a box, and after entering, the cod circle and can not find the way out. Handlining is a process whereby a line, weight and hook is baited and thrown overboard. Similarly, with longlining a fishing line with more than one hook is used. Trawling occurs when a weighted cone shaped net is towed along the bottom of the ocean, trapping fish in the "cod-end" as it goes. Gillnetting is a process whereby a net fence is set using weights and floats. The cod's head will fit through, but not its body, and its gills will prevent it from backing out. Lastly, a purse-sein is a net that encircles the fish, then the bottom of the net is drawn in, trapping them. Silver Donald Cameron, "Almighty Cod!

developed in 1918, and inabled the offshore fleets to catch larger amounts of fish. Although there are not many statistics available for this time period, it appears that the total landings of fish off the Atlantic coast after 1883 were between 500 and 600 thousand tons. An important percentage of these landings consisted of groundfish species,[3] as can be seen in that 3/4 of the fish caught consisted of cod.

After World War II, cod continued to be one of the most important catches for many of the Europeans who fished in Atlantic waters. With the exception of Spain, these European fishermen had no use for other species of fish and so discarded everything that was not cod. Canadians had found ways of using other species, including redfish, flatfish and haddock. The Atlantic fishery expanded quickly, with catches increasing to a total of 1.2 million tons by 1957[4], of which cod made up 70% of the total. Differences developed in the methods of fishing, as trawlers became popular with the Europeans, and cod traps became prominent in Newfoundland.

It Reigns Supreme Over our Atlantic Fishery," Canadian Geographic, June/July 1988, pp. 36-37.

[3]The Atlantic region catch of groundfish includes cod, flounder (yellowtail witch and American plaice), redfish (ocean perch), haddock, pollock (Boston bluefish) and turbot (Greenland halibut). The fact that these fish are known as groundfish reflects the fact that they feed primarily off the ocean floor. Many of the groundfish species follow yearly patterns of movement; cod, for example, moves inland from May to September, providing the basis for the summer inshore fishery.

[4]For a complete listing of Atlantic groundfish catches and landed values, see Table i.

Table 1
Atlantic Catches and Landed Values of Principal Groundfish Species

(Q) Nominal catches in metric tons, live weight
(V) Landed values in thousand dollars

SPECIES	1956	1959	1962	1965	1968	1971
Cod	356,053 16,396	347,896 17,023	318,637 18,904	313,225 23,637	323,070 24,350	244,480 25,130
Haddock	84,582 4,882	60,962 4,970	62,608 4,869	50,585 6,054	49,595 6,853	29,174 5,981
Pollock	22,496 758	25,203 920	33,100 1,656	28,011 1,868	18 247 1,146	12,035 1,000
Redfish	27,055 1,274	18,424 977	27,721 1,585	59,135 3,419	97,444 5,545	112,776 8,654
Small Flatfish	33,668 2,287	41,409 2,837	46,347 3,244	92,039 6,493	106,628 8,063	128,101 13,913
Other	23,733 1,983	23,071 2,445	21,026 2,629	27,739 2,968	33,526 3,405	42,075 4,888
TOTAL	547,587 27,580	516,965 29,172	509,439 32,887	570,734 44,439	628,510 49,362	568,641 59,566

SPECIES	1972	1973	1974	1975	1976	1977
Cod	219,146 26,158	176,636 29,670	156,806 32,132	145,917 30,596	193,550 42,994	237,622 61,743
Haddock	17,206 4,515	18,210 6,427	14,800 5,738	19,447 7,118	19,326 8,142	26,832 11,408
Pollock	18,283 1,644	27,226 2,893	25,188 3,252	26,648 3,655	32,238 3,362	25,948 4,065
Redfish	109,917 9,476	158,442 17,306	87,693 9,479	102,916 12,045	89,654 11,448	66,594 9,781
Small Flatfish	116,980 14,012	122,149 18,243	98,756 16,816	91,952 15,588	110,373 20,382	111,081 23,436
Other	39,927 5,439	37,263 6,185	34,535 6,444	34,012 6,747	33,525 7,270	47,278 10,535
TOTAL	521,459 61,244	539,926 80,724	417,788 73,861	420,892 75,749	469,666 93,598	515,355 120,968

Source: Canadian Fisheries Annual Statistical Review, 1975-1986.

Table 1

Atlantic Catches and Landed Values of Principal Groundfish Species

(Q) Nominal catches in metric tons, live weight
(V) Landed values in thousand dollar

SPECIES	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**
Cod	296,859	377,986	422,092	439,433	517,352	509,052
	86,382	121,269	142,876	162,809	193,255	187,451
Haddock	43,034	34,599	54,262	57,024	46,403	39,777
	18,612	15,993	26,474	24,941	23,078	24,295
Redfish	77,065	80,627	48,982	72,066	66,023	58,253
	13,066	15,407	9,973	14,254	13,553	12,828
Small Flatfish	109,176	110,186	104,887	105,341	93,665	76,963
	24,317	27,816	29,591	29,077	27,432	23,330
Pollock	27,534	31,227	36,751	40,618	38,576	33,843
	5,135	6,984	9,191	10,830	11,418	8,701
Other	58,384	67,929	72,810	64,254	58,308	48,243
	14,754	20,125	22,854	21,823	22,223	19,988
TOTAL	612,052	702,554	739,784	778,736	820,327	766,131
	162,266	207,594	240,959	263,734	291,139	276,593

SPECIES	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**
Cod	474,925	480,471	474,720	458,051	467,871	413,973
	171,278	185,769	215,480	319,951	239,199	219,782
Haddock	32,654	37,095	44,720	28,071	30,954	25,690
	22,641	27,830	37,160	34,408	28,288	24,954
Redfish	65,110	71,388	79,670	79,016	77,904	72,661
	14,481	16,432	23,570	24,740	25,144	20,117
Small flatfish	79,990	89,113	89,300	90,629	73,945	68,310
	25,563	30,062	37,710	48,330	36,912	36,991
Pollock	35,217	44,832	49,680	50,223	44,353	44,221
	8,357	11,319	18,020	26,576	15,145	19,716
Other	47,149	45,184	47,870	58,415	38,814	39,992
	22,487	25,630	36,220	58,392	27,789	32,259
TOTAL	735,045	768,083	785,960	764,225	733,841	664,847
	264,807	297,042	368,160	512,397	372,477	353,819

Source: Canadian Fisheries Annual Statistical Review, 1975-1986.

Historically, the fishing industry in Newfoundland played an important role in its economy, providing more jobs than any other industry. When the province joined Confederation in 1949, the rich fishing grounds of the Grand Banks became part of Canada's fishing interests. This helped to focus Canadian attention on the vast numbers of foreigners who were fishing Atlantic waters, but serious economic analysis of the common property problem of the Atlantic fishery did not really begin until the mid 1950s.[5] In the meantime the government reacted to the fishery in an *ad hoc* fashion in terms of any kind of assistance or support. The absence of a consistent development plan caused the assistance policies of the 1950s and 1960s to be largely ineffective. For example, the unemployment benefits program introduced in 1957 to help self-employed fishermen influenced many to work shorter periods during the fishing season and not look for other work during the off-season.[6] Many development plans were introduced without careful consideration of economic conditions. For instance, subsidies were offered to fishermen to help them acquire better boats and advanced equipment. In many cases the fisheries under question were already being fully exploited, so the catch could not be

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[5]Parzival Copes, "The Evolution of Marine Fisheries Policy in Canada," Journal of Business Administration 11 (1979-80): 131.

[6]Ibid., p. 132.

expanded with the new gear. Many fishermen took the same catch as before, but incurred much higher operating costs.[7]

During this time, most of the fishermen involved in the Atlantic industry were employed in the inshore fishery. The boats used did not go far from shore and were rarely able to stay out overnight. Weather conditions played a crucial role in determining the length of the season, and a lack of alternative employment opportunities kept the industry overcrowded and incomes low. There was also a small Canadian offshore fishery located off the Atlantic coast. It used more capital intensive and larger vessels than the inshore fishery, and was able to operate year round, often staying out at sea for more than a week at a time. The average catch of the offshore fishermen was often ten times greater than that of the inshore fishermen, accounting for the wide difference in income between the two fisheries.

After 1958, major expansions were made in the fishing methods that were being used in Atlantic waters. Factory trawlers allowed many species to be processed and frozen at sea, and sonar techniques found schools of fish that otherwise would have been missed. Many European fleets were now able to stay in the Atlantic region for months at a time, often fishing the whole period without stopping. The Canadian authorities realized that in order for Canadian catches in the Atlantic

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[7]Ibid.

region to increase, it would have to expand its offshore fleet. The government introduced a new Fisheries Household Resettlement Program in 1965 with Newfoundland that would move large numbers of inshore fishermen away from coastal communities into centrally located towns. The goals of this program were to reduce the numbers of inshore fishermen and place them in growth centers based on the offshore fishery and its associated processing plants.[8]

The cod industry off Newfoundland expanded with the development of a new winter fishery. These contributions to the fishery allowed greater stocks of fish to be caught, and landings off the Atlantic coast increased to 2.5 million tons before the late sixties. Canadian and foreign fleets were now able to focus their attention on obtaining large quantities of many different species of fish. The result was a marked reduction in many stocks of fish, with cod, herring and haddock decreasing by 50% or more.[9]

Uncontrolled foreign fishing and high rates of unemployment in the Atlantic provinces added to the problems facing the industry. In 1964 Canada realized that the situation was getting serious, and attempted to alleviate the problems of overfishing by declaring a new nine mile fishing zone beyond the three mile zone already in place. In 1970 Canada also

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[8]Ibid., p. 134.

[9]Regier, p. 1896.

declared the Gulf of Saint Lawrence to be totally Canadian. Neither regulation brought any relief to the problem. The total groundfish catch rose to 2.7 million tons by 1968, with much of this increase being taken by foreign fleets. During the years 1965 to 1968, the Canadian catch of groundfish fell from approximately 1/3 of the total landings to less than 1/4, ranging between 450,000 and 620,000 tons per year. The situation deteriorated significantly in 1974 when the Atlantic groundfish catch fell to 417,788 tons from 539,926 in 1973.

During the 1970s, the trawler fishery in the Gulf of St. Lawrence was no longer based exclusively on cod; now redfish was one of the most important species. Between 1971 and 1976, 70% of all groundfish taken from the Gulf consisted of redfish, which had landings of 107,000 tons in 1973. But the situation had worsened by 1977, when the catch of redfish in this area dropped to 6,400 tons, this being the most dramatic decline that had ever taken place in a Canadian trawler fishery. At the same time, fishing effort on the stocks around Newfoundland began to increase, and from 1971 to 1976 over 30% of the total Atlantic trawler catch came from those waters. From 1979 to 1980, 52% of all Atlantic coast trawlers focused their fishing effort in the waters off the coast of Newfoundland. The increased numbers of fish being caught by the trawlers eventually caused stocks to diminish in this area. Catches declined by 5,000 tons from 1978 to 1981, during which time the share of groundfish coming from the Newfoundland fishery fell from 13% of the total to only 9.5%.

In 1977, Canada extended its fisheries jurisdiction from 12 to 200 miles in an attempt to help expand the groundfish industry. The health of the fish stocks improved, and quota allocations to Canadian fishermen also grew, with those going to foreign fleets declining from 853,000 tons in 1977 to 217,000 tons in 1988. The Canadian catch of groundfish increased in 1981 and 1982, rising to 778,736 tons and 820,327 tons respectively from 469,666 tons in 1976. The increase did not continue though, and the landings of groundfish fell to 735,045 tons in 1984 At the same time, a crisis developed in the fishing industry in 1980, when interest rates and fuel prices soared. This brought with it the closure of many fish plants across the region. It should be noted that these closures were not due to supply problems, since the fish stocks themselves were not affected by the crisis. Nova Scotia and Newfoundland were the hardest hit, and in an attempt to help the region, the government created Fishery Products in Newfoundland and placed National Sea Products in Nova Scotia under new management. National Sea went from having losses in 1984 and 1985 to record profits of $10 million, $36 million and $25 million over the next three years. Fishery Products did even better with profits of $47 million in 1986 and $56 million in 1987.[10]

Low oil prices and a depressed Canadian dollar highlighted the situation in 1987. American consumption of fish increased, and reached levels that were 20% greater than in 1983. Canada exported 366,045 tons of fish to the United States, their largest export customer. In 1989, the groundfish landings in Atlantic Canada were down from 1986, falling to 664,847 tons as fish were becoming much harder to find. The situation in the Atlantic region worsened in the following years as fisheries scientists announced that there were fewer fish in the Atlantic waters than they had previously thought. In Newfoundland quotas of northern cod were cut from 266,000 tons in 1988 to 235,000 tons in 1989, and 197,000 for 1990. In fact, the catch for 1990 was much lower than expected at 109,851. Things looked just as bad in the Scotia Fundy region where quotas were cut from 279,000 in 1982 to 168,000 for 1990.[11] By October, 1990, the situation had deteriorated to the point that nineteen fish plants had been closed in the Atlantic region, including four in New Brunswick, eight in Nova Scotia, three in Prince Edward Island and four in Newfoundland.

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[10]Silver Donald Cameron, Net Losses: The Sorry State of our Atlantic Fishery," Canadian Geographic, April/May 1990, p. 30.

[11]Ibid., pp. 35-36.

Overview of the Atlantic Groundfish Industry

The Atlantic groundfish fishery takes place in four main areas; the Scotian Shelf, comprising the area from the Bay of Fundy to Cape Breton island; the Gulf of Saint Lawrence; the Grand Banks of Newfoundland; and the Labrador Coast, covering the ocean to the north and east of Newfoundland. The two areas that dominate the fishery are the Scotian Shelf and the Grand Banks.[12] Together Nova Scotia and Newfoundland account for 80% of the fishery in the Atlantic region. Although Newfoundland is the leader in volume, Nova Scotia leads in terms of landed values.

Groundfish are extremely important to the Atlantic fishing industry, accounting for approximately 60% of total fish landings and 40% of the total landed values.[13] After the groundfish is caught, it is processed into a number of products. Only about 35 to 40% of the fish is flesh, the rest being bones, skin and other waste. There are many ways to process the groundfish, but it is most often frozen. In 1989, almost 47% of the groundfish harvested went into frozen fillets and 30% into frozen blocks. These blocks must undergo further processing to transform them into consumable products including fish sticks and canned fish. Approximately 1/4 of the groundfish caught is salted, and is almost exclusively cod. It

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[12]Ibid., p. 29.

[13]Department of Fisheries and Oceans, Today's Atlantic Fisheries (Ottawa: Communications Directorate, 1989), p. 2.

is first heavily salted, and depending on its moisture content, is labelled as either wet or dry. Less than 10% of all groundfish is sold as fresh fish. The values of these groundfish products for the years 1955 to 1987 are shown in Table 2.

Table 2

Value of Atlantic Groundfish Products

Values in thousand dollars

Year	All Products	Year	All Products
1955	58,590	1972	177,646
1956	56,748	1973	244,306
1957	56,499	1974	194,878
1958	65,164	1975	215,354
1959	64,163	1976	289,247
1960	63,005	1977	357,115
1961	67,089	1978	458,302
1962	77,638	1979	567,107
1963	91,494	1980	599,070
1964	94,616	1981	677,817
1965	105,354	1982	784,398
1966	113,023	1983	725,478
1967	101,463	1984	760,144
1968	109,465	1985	868,800
1969	129,326	1986	2,058,960
1970	123,830	1987	2,384,320
1971	155,926		

Source: Canadian Fisheries Annual Statistical Review, 1975-1986.
Canadian Fisheries Statistical Highlights, 1987.

In 1987, the export value of Canadian fish products was $2.7 million, with a large proportion of these coming from the Atlantic region. Canada exports the majority of its fish products to the United States; in 1987 this amounted to 62% of the total, up from 59% in 1986. Together Canada and the United States consume over 80% of all Canadian groundfish, although Canada has been finding increased markets in Europe, Japan, Latin America and the Caribbean during the 1980s and early 1990s.

The fishing industry is an important sector in Atlantic Canada, although it contributes less than 0.5% to the Canadian GDP. The greatest effect of the fishing industry can be seen in Newfoundland, accounting for about 15% of the goods-producing sector, followed by Nova Scotia and Prince Edward Island, at 13% and 11% respectively. Between 1977 and 1988, the value of output of the fisheries in the Atlantic region grew by 57%.[14]

Of the 60,509 fishermen issued licenses in the Atlantic Canada in 1986, approximately one-half were classified as full time fishermen, and the rest classified as part time. A full time fisherman is one who fishes continuously for a specified period of time in a certain area, only taking on occasional jobs in other sectors during the fishing period. A part time fisherman does not meet these requirements. In 1984, Atlantic fishermen fished an average of 17.5 weeks, with the longest period being in Nova Scotia at 26.1 weeks and the shortest in New Brunswick at only 12.6 weeks.[15]

In 1981, more than one quarter of the total population in the Atlantic Provinces lived in small fishing communities,[16]

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[14]Ibid., p. 3.

[15]Department of Fisheries and Oceans, <u>1984 Survey of Atlantic Fishermen</u>, Economic and Commercial Analysis Series, Surveys and Statistics Report 37 (Ottawa: Communications Directorate, 1987), pp. 5-8.

[16]Task Force on Atlantic Fisheries,.p. 70.

with direct fishing and processing plants accounting for at least 30% of the total labor force. In the Atlantic region the total number of registered fishermen was 57,024 in 1983, rising to 60,509 in 1986 and 65,791 in 1988. At the same time, the number of individuals working in fish processing plants rose from 30,000 to 32,920 over the same time period. Because the number of fishermen increased by 8,767 between 1983 and 1988, and the number of processing plant workers increased by 2,920 over this same period, freezing capacity in the Atlantic region increased by more than two and a half times.

At the same time, the fishing capability of the vessels grew over this time period because the vessels were becoming more efficient. Although the number of licensed boats remained relatively the same, their holding capacity increased dramatically. In 1982 there were 225 boats under 45 feet with a capacity of up to 25 gross registered tons, in 1989 there were only 150 boats of this size and capacity. One the other hand, the number of boats under 45 feet with a capacity 26 to 50 tons has increased from 150 in 1982 to 200 in 1989. The trend has definitely been to boats that can carry larger amounts of fish.[17]

There are numerous problems with the groundfish industry in the Atlantic region, many of which have been the result of this rapid expansion in the number of fishermen, vessels and

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[17]Department of Fisheries and Oceans, Today's Atlantic Fisheries, p. 12.

processing facilities following the extension of the limit to 200 miles. Plants were built rapidly during this time to handle the large numbers of groundfish that came in during the peak period, bringing with it periods of under-utilization in the off periods. This, followed by periods of high interest rates and increased operating costs, placed many of the plants in this region in serious financial trouble. Presently, nineteen plants across the Atlantic provinces have been closed, some with no hopes of reopening.

Most of the commercial fisheries on the Atlantic Coast are subject to limit entry licensing to keep the number of fishermen at a level which should allow for the rebuilding of commercial stocks. The total number of licences is held constant, so the only opportunity for new entry into the industry is through the re-issuance of an already existing license when a fisherman leaves. If a fisherman, for example, wanted to leave the groundfish fishery to fish lobster or scallops, then he would have to obtain a special license to do so. At the same time, the exploitation of all Atlantic groundfish stocks is on the basis of Total Allowable Catch (TAC), which is the maximum tonnage of a fish stock that can be harvested during a fishing season. The reference point for the setting of these TAC's is a level of fishing mortality of 20% natural plus 20% from fishing effort.[18] There are a host of

[18]Ibid., p. 6.

other regulations which face an Atlantic fisherman, some of which will be discussed in more detail in a later chapter.

CHAPTER III

REPORT OF THE SCOTIA-FUNDY TASK FORCE

Introduction

In Chapter II, the fishery, with emphasis on the Atlantic groundfish industry, was examined in detail. It would be useful at this point to focus on a specific aspect of the Atlantic fishery, the Scotia-Fundy groundfish fishery, so that a complete analysis of management practices and policy can be made.

Overview of the Scotia-Fundy Groundfish Industry[1]

Canadian groundfish landings on the Scotian Shelf totalled almost 200,000 tons in 1988, 78% of which was made up of cod, haddock and pollock. These species dominate the fishery on the southern half of the Shelf, while the northern fishery relies primarily on cod. The abundance of these species in the Scotia-Fundy region rose after 1974, only to decline again during the 1980s. These species have all suffered from high exploitation rates, but the most serious effects have been seen in the haddock stocks, where exploitation rates were larger than the target levels every year from 1984 to 1988.

Landings of haddock taken from their main spawning grounds of Sable Island Bank, Browns Bank and Georges Bank averaged

[1]The information in this chapter draws heavily on: Report of the Scotia-Fundy Groundfish Task Force, J.-E. Haché, chairman (Nova Scotia: Department of Fisheries and Oceans, 1989).

about 50,000 tons a year before 1986. In the year that followed, landings of haddock dropped to half of this level, to 23,801 tons. Stock sizes were not able to replenish themselves due to the fact that over 50% of the available haddock stock was being harvested every year. At the same time, research done on this fishery has shown that the number of mature haddock were at their lowest levels ever, supporting the claim that the average fish is smaller and younger than ever before. Between 15% and 20% of the haddock on the Scotian Shelf are too young to spawn, and at current rates of exploitation, most of these will be harvested before they mature. Because of this, scientists fear that the haddock stocks of the Scotia-Fundy region may be close to collapse.

The situation does not look to be quite as bad for the cod stocks in the region, where landings before 1986 averaged about 100,000 tons per year. The period between 1986 and 1988 showed a slight decline from this level and fisheries scientists expected landings to continue to fall. However 1987 figures showed the cod landings to have increased to 132,493 tons. The exploitation rate of 24% in the northern Scotian Shelf has not yet had a significant effect on the stock size, allowing the cod stocks there to remain fairly stable. On the other hand, exploitation rates have reached 35% on Browns and Georges Bank, and, while no long-term damage to the stock has resulted, declines in yield will become significant if the exploitation rates do not fall.

The pollock fishery in the Scotia-Fundy region also warrants some discussion. Landings of this species from the Scotian Shelf and the Canadian part of the Gulf of Maine have averaged about 36,000 tons per year. The stock size rose to a peak in 1984, but has dropped slightly since. Exploitation rates of about 30% in 1989 were higher than desired, but will not likely have any serious effects on the stock due to the fact that immature pollock are only being harvested at very low rates.

The Scotia-Fundy groundfish industry is of major importance to the economies and communities involved, especially coastal areas in Nova Scotia and southwestern New Brunswick, generating 46% of the value of the $1 billion Atlantic groundfish fishery. Many rural communities depend almost exclusively on this fishery for their livelihood. In 1988 there were 8,669 full-time jobs in the region involved in the processing industry of the inshore and the offshore fisheries.

The Scotia-Fundy groundfish fleet is made up of about 2,800 licensed vessels, most of which are fixed gear vessels under 45' in length. The quotas being allocated to the fleets on the Scotian Shelf have steadily decreased since 1982, but the proportion of the total allowable catches (TAC) of each fleet has remained reasonably stable. Due to the increased fishing power of new boats, the number of licences and vessels operating in the Scotia-Fundy region have not increased in the last ten years. These new boats have been equipped with larger holding capacities, bigger engines and advanced electrical detection techniques.

The fish processing industry is also very important to the region, where in 1989 there were about 390 processing establishments. The sales of fish products from this area were valued at approximately $868 million in 1988, $458 million of which were groundfish products. About 80% of all the groundfish taken from the Scotia-Fundy region is sent to the United States, where the demand for fish has increased steadily during the 1980s.

By the end of June 1989, the Scotia-Fundy inshore mobile gear fleet had caught most of its groundfish quota for that year. The fishery had to be closed for the rest of the season, bringing general hardship for everyone involved. In an attempt to find a solution, the Minister of Fisheries and Oceans, Tom Siddon, commissioned the Scotia-Fundy Groundfish Task Force to develop a list of recommendations that, if implemented, would provide some solutions to the current problems facing the groundfish industry. Over thirty public meetings were held in the Scotia-Fundy region with fishermen, plant workers, companies and associations in the hopes that a successful plan could be introduced.

Task Force Findings

Many of the opinions put forth by the fishermen suggested that the catch statistics from vessel logbooks are intentionally being altered to underestimate the actual landings, making them terribly inaccurate. At the same time, many of the surveys and reports being done by the Department of Fisheries and Oceans (DFO) were criticised by the fishermen, who felt that scientists are carrying out their surveys and looking for fish in all the wrong places.

In terms of management policies, the Task Force found that many fishermen could understand the need for quotas, while others felt that they were not useful or necessary. Suggestions were made concerning alternative and more effective means of controlling the amount of fishing taking place, including increased fish size limits, the introduction of square mesh nets instead of the traditional diamond shape mesh, the closing of nursery areas and a culling of the seal population. Fishermen wanted higher penalties for offenders, including fines and suspensions of fishing licences.

The Task Force took all of these considerations into account when developing their list of recommendations, the most important of which will be discussed in more detail under five headings in the next section.

Recommendations of the Task Force

Conservation:

The conservation of fish stocks is a priority to a management policy designed to help a fishery in trouble. The Task Force addressed this issue by discussing the option of closing many nursery and spawning areas to fishing in an attempt to allow the stocks to grow and replenish themselves. In particular the Task Force recommended that the Emerald/Western nursery area be closed to mobile fishing gear all year round, and that the already existing closure on Georges and Browns bank be extended.

The Task Force also considered mesh sizes as a conservational method. The mesh size being used at the time of the study was 16 inches, but many of the fishery participants thought that this was too small, since many immature and young fish, which can be as large as 17 inches, cannot escape. As a result, the Task Force recommended that the diamond shape mesh restriction be increased from the current size of 130mm to 155mm. This brought with it much opposition as increases in diamond mesh size would be accompanied by increases in operating costs by about 15%. The Task Force provided an alternative to this problem by introducing 140mm square net mesh which would serve the same purpose. To make enforcement of these mesh sizes easier, it was suggested that mobile gear fishermen be prohibited from possessing nets of two different mesh sizes during any particular fishing trip.

Commercial Catch Monitoring:

During meetings and discussions it was noted that many of the fishing industry participants were concerned with the fact that there is a high motivation for fishermen to misreport the areas fished and the catch. There were also concerns raised about highgrading, the process by which small and less desirable fish are discarded when a better stock is found. This makes monitoring difficult, and as a result, the Task Force recommends that all fishermen be required to keep accurate records and that new electronic surveillance techniques be developed to assist in at-sea monitoring.

Enforcement:

The Task Force made note of a number of criticisms of the enforcement methods outlined in the Fisheries Act, where its maximum fine of $5,000 for illegal fishing was looked at as being much too lenient. Many fishermen are not concerned about getting caught, feeling that the cost of the fine would be worth the risk. The Task Force suggests that this fine be made much more severe, and that a broader range of penalties including licence suspensions and cancellations be developed.

International Competition:

The amount of foreign fishing in the Scotia-Fundy region is at times extensive, especially the USSR/Cuban silver hake fishery. Silver hake is not a species that is exploited by Canada, but there is a bycatch of the important species of cod, haddock and pollock associated with this fishery. While this bycatch is not excessive, it still amounted to approximately 250 tons of cod, 720 tons of haddock and 2,370 tons of pollock in 1989. The Task Force suggested that Canada work to have the bycatches from the silver hake fishery brought back to its own plants instead of having it processed elsewhere.

Fleet Management:

One main concern that the Task Force tried to consider was the amount of overfishing taking place as a result of the increased capacity of the fleet in the Scotia-Fundy region. Even though other management policies may be present, there is a tendency for vessels to develop a capacity for catching fish that is much greater than needed. Several solutions to this problem have been suggested. One is to leave the industry alone and let the problems work themselves out. A second is to try and develop policies which would limit the capacity that was allowed, however this method has historically brought with it great opposition. Individual quotas, where each fisherman is allocated a certain catch size, has been suggested since there would be no motivation for the fisherman to increase his capacity beyond this point.

The Task Force recommended that the fishermen in the Scotia-Fundy region be given the choice to join one of their industry participant groups as described:

Group A includes only fixed gear fishermen on boats which operate on short trips only. This fishery would have a season of approximately six months with no chance of early closure.

Group B would consist mainly of fixed gear fishermen with the exception of a few flounder fishermen using mobile gear. This group would make longer trips than the fishermen in Group A, but when the quota allocations have all been caught, the fishery will close for the season.

Group C participants would be limited to vessels under 65 feet in length with mobile gear licenses. The fleet shares of the total allowable catch will be such that the fewer the vessels participating in the industry, the larger the share per vessel. The fishermen in this group would be free to choose their own management system, whether consisting of individual quotas, group quotas or individual transferable quotas. For further explanation of these groups see the following chart.

Fleet Structure Summary

Inshore (Vessels under 65 feet)

Group A
--Fixed gear fishing only
--Retain all licenses
--Small trip limit (e.g. 1500 kg)
--6 month season
--3 year trial program

Group B
--Fixed gear (except option for mobile gear to fish
flounder with 10% bycatch of cod, haddock and pollock)
--Retain all licenses
--Competitive fleet quota
--Quota is fixed % of TAC
--Trip limits/trimester quotas
--Total closure when quota reached (no 1500 kg)
--3 year trial program

Group C
--Must have mobile license
--Retain all licenses
--Competitive fleet quota in 1990
--Quota is fixed % of TAC
--Trip limits in 1990
--Trimester quotas in 1990
--Fleet choices beyond 1990
  -individual quota
  -individual transferable quota
  -self-funded license retirement
  -other options
--Entry fees required ($ thousands)
--3 year trial program

Midshore (65-100 feet)

--Existing enterprise allocation approach
--Increased observer coverage required (some industry funding)

Offshore (over 100 feet)

--Existing enterprise allocation approach
--By 1993 achieve full observer coverage, 100% industry funded
--or Industry/Government agreement on alternative means
for at-sea and in-plant monitoring

Source: Report of the Scotia-Fundy Groundfish Task Force.

The purpose of this chapter has been to give a brief description of the Scotia-Fundy region of the Atlantic groundfish industry and outline the main recommendations of the Task Force which studied it. In the following chapter these recommendations will be analysed to determine whether they have the potential to be successful in alleviating the problems facing this industry.

CHAPTER IV

ANALYSIS OF THE TASK FORCE'S RECOMMENDATIONS

Requirements of a Successful Management Plan

In order for the recommendations of the Task Force to be successful, they must fulfill certain requirements. These include simplification of the rules, minimization of fishing costs, and the setting in place of accountable regulatory institutions.[1] They must also be able to provide for improved enforcement as well as communication between the fishermen and fisheries officers in the Scotia-Fundy region.

The Atlantic, as well as the Scotia-Fundy groundfish fishery, is governed by complex rules and regulations that can be hard for fishermen to follow, let alone understand. These kind of regulations can become problematic, often leading to conflicts between the fishermen and the DFO officers as increased regulation is often seen as being unfair. Many fishermen feel that they are being bogged down by unnecessary rules and view the motives of the DFO officers as being political in nature with no benefit to the industry. This kind of resentment often leads to contempt for regulations of any kind and for those who must enforce them. As antagonism and conflicts develop between the fishermen and the DFO officers

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[1]Anthony Scott and Philip A. Neher, eds., The Public Regulation of Commercial Fisheries in Canada (Ottawa: Canadian Government Publishing Center, 1981), p. 39.

they oppose each other instead of working together as one would hope.

At the same time, the necessary, but much too frequent, revisions of many regulations pertaining to quotas, gear and season length have made matters even worse. Because of these conflicts and disagreements, fishermen in the industry are not motivated to use improved and more efficient fishing methods or consider new fisheries management programs. Instead they are expending much of their energy in finding ways of circumventing the rules and fisheries officers.

While the fishing industry at the present time appears to be controlled by too many laws and rules, complete deregulation is not an option. We must be ever mindful of the common property nature of the fishery, as no rules would, of course, result in there being too many fishermen taking part in the harvest. If catch limits are not present, this over-abundance of fishermen will bring serious depletion to already endangered stocks. Simplification of the rules governing the industry would be the first step in ensuring that seemingly arbitrary and complicated regulations would be kept to a minimum, allowing all those taking part to operate in the most efficient manner possible.

Another requirement that must be filled before the Task Force's recommendations can be successful concerns minimizing administrative costs. The costs that are present in the fishery are very important when evaluating different policies and management plans. Many of these costs must be absorbed by the fishermen, the rest must be covered by the public through taxes. Pearse, in his 1978 study, classified these costs as follows:

> for the fisherman, the costs of transactions, of compliance, and of signaling or complaining about common property or public goods, provisions, and systems; for the administrator, the costs of information about technology, behavior, and preferences,the costs of setting up and carrying on administration, the costs of obtaining biological information about fish stocks and their interactive ecologies, the costs of monitoring and enforcement, and the costs of co-ordination with adjoining administrative jurisdiction.[2]

When the costs of regulation become greater than the benefits that result from it, modifications must be made to the system before it can be economically viable. When developing recommendations and policies, it is important to look for the combination that will minimize costs for any particular fishery.

Before a system of recommendations and suggestions can fully benefit the fishing industry, it is important to determine that the resource is being used to its fullest potential. In other words, fishermen should be given rights and quotas to use the resource in ways that will not diminish, harm or waste it. Scott and Neher discussed this in a study

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[2]Ibid., p. 40.

that was completed in 1981.[3] This study concluded that a common property resource such as the fishery should consist of a system of individual and exclusive rights to use the resource which would encourage freedom and individual initiatives. This kind of system is one in which fishing rights are finely divisible and can be bought and sold in the open market, in whole or in part, and thus will maximize the social wealth achieved from the fisheries.

The option of being able to buy and sell fishing rights in the open market will give the industry and its participants more flexibility in the face of changing economic conditions. This has many advantages. These transferable quotas, which would be divisible into parts, will benefit the small operator who would otherwise not be able to afford to pay for his nontransferable share. The fishing rights under this system would be bankable, serving as collateral if a loan became necessary. At the same time, if a fisherman caught more than his quota of a particular species, he would be able to buy unused quotas from other fishermen. On the other hand, if he was not going to meet his quota, he could sell the unused portion to someone who could make better use of it.

For those who do not agree with the transferable quota system, alternatives have been suggested. One is to sell short term fishing rights every few years instead of making them

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[3]Ibid., pp. 41-44.

transferable. This would still enable the quotas to change hands as the demand for them changed. Other researchers have looked at ways of modifying the method of giving fishermen quotas that are not transferable and which expire upon death. However, the fishermen will likely be motivated to stay active in the industry as long as possible. Retirements will be postponed and in many cases the fishing right will not be used to its full potential. An alternative to this approach would allow the fisherman to sell his quota when he wished to retire.

It is important that fishery rights be readily attainable for those who are best suited to participate in the industry. If the quotas become too costly then the individual small scale fisherman may not be able to compete against a group or large scale operation, such as National Sea. Many small communities depend on the fishing industry for their livelihood and are finding it increasingly difficult to maintain a satisfactory standard of living as a result of the problems being faced in the region.

Another method that could be used to modify the existing quota system is to make them time and location specific. The common property nature of this industry implies that all fishermen will be competing for the best stocks of fish. This brings with it congestion and peaking problems, and often results in many areas being overexploited and depleted. Defining fishing rights by time and location could alleviate some of these negative effects. This kind of system would enable the fisherman to work in his own time, place and manner, as quotas could be traded until the desired characteristics are found.

The nature of the fishery as a common property resource brings with it some risk, due to the uncertainty of the resource base. Overestimates in quota allocations can mean that the fishermen's quotas could be cut part way through the season without any warning. This will encourage those taking part to fish more than their share early in the season as a way of protecting themselves. When a fishery closes early, it is the fisherman who must face the costs of lost employment and income. Thus a good management plan should somehow find a way to spread the risks and take the pressure off the fishermen, resulting in a more efficient and successful industry.

A solution to the problems surrounding the quota system that has been suggested is the share system, where the crew of the fishing vessel takes part in sharing the net proceeds of each fishing trip. Under such a system the crew would not usually receive any hourly or weekly wage; rather their pay would be determined by the relative success or failure of each trip. This allows for the low returns from bad trips and the high returns from good trips to be shared between the owner and the workers. Sutinen has shown that a share system will increase the number of fishermen employed, crew incomes and overall output from the industry.[4] The share system would provide the incentive for workers to become more efficient and work harder as the results of their work will determine how much they are paid.

Even with the new technology and surveillance techniques, it is becoming increasingly difficult for DFO officials to monitor the actions of the fishermen. Regulations that are developed should encourage obedience through simplified rules and/or strict penalties and fines. The penalty should keep the fishermen from taking any chances of breaking the rules.

Analysis of the Recommendations

Of all of the recommendations made by the Task Force, the ones regarding fleet management are the most important in terms of stock conservation and management of the stocks. As described in the previous chapter, the Task Force recommended the development of three groups of fishermen for the Scotia-Fundy region. Of these only aspects of Group C have been implemented to date. Groups A and B, while consisting of large numbers of fishermen, are not as significant in terms of their impact on the industry so the recommendations concerning the development of these groups have not yet been implemented. These two groups consist of fixed gear fishermen, who do not catch the numbers of fish that can be taken using mobile gear.

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[4]Lee G. Anderson, The Economics of Fisheries Management (Baltimore: Johns Hopkins University Press, 1986) p. 156.

The mobile gear fishermen of Group C, through the use of such methods as draggers and purse seines, have the ability to stay out at sea for long periods of time and their increased fishing capacity allows them to catch substantial numbers of fish. Since they have such a large impact on the industry, the emphasis of the program has been on this group. Because of the overcapacity problems that have been prominent in the region, it was decided that it would be easier from a management point of view to have fishermen choose between fixed and mobile gear licenses. This made the development of the three groups of fishermen and the enforcement and regulation of their activities much easier.

Until the late 1960s, the main objective of Canadian fisheries management was to protect the fish stocks; economic performance of the industry was a secondary concern. Conservational policies consisted of gear restrictions, closed spawning areas and restrictions on boat size. While these policies aid in the protection of the fish stocks, they do not directly address the economic problems facing the industry and its fishermen. The use of individual quotas (IQ's) and individual transferable quotas (ITQ's) can be a positive step in this direction, and the development of an ITQ program for the Group C fishermen of the Scotia-Fundy region began in January 1991.

Before the introduction of individual quotas, the incentive to the fisherman was to obtain the style and type of boat and gear that would give him the competitive edge over the other participants. Since all the fishermen in the industry were competing in this manner, overcapacity of the fishing fleets resulted. Each fisherman tried to land large quantities of valuable catches before they could be harvested by others. With IQ's the incentive of the fisherman is no longer based on getting a large quantity or share of fish, because this number is now fixed. Under this system the fishermen are interested in maximizing the revenue of their quota through high quality fishing (fishing at the best time of the year, handling the fish carefully, no longer competing for quantity), bringing many positive results to the industry.

While a system of individual quotas will bring many beneficial results to the industry, there will also be some problems. One of these will be that the fishermen will not be discouraged from highgrading. This is a process whereby lower valued fish are discarded from the boat when higher valued ones are discovered. Since the emphasis of the fishermen is now on quality, this practice may become an even more serious problem. Increased enforcement and stricter penalties will be required to ensure that this problem does not become magnified.

When determining how the available quotas should be divided among the participants, there are many factors that must be considered. These include years in the fishery, historic catch, minimum/maximum shares, the size of the vessel, and level of investment. The fishermen and management alike agree on the fact that distributing the quotas equally is not a good idea, but determining a favorable formula is not easy task. In the end the allocation formula was based on reported historic catch as follows:

> -Vessel size and investment was given consideration by recognizing a split in the fleet quotas so that 133 vessels between 45-65 feet got about half of the quotas and the 322 vessels under 45 feet shared the remainder.
>
> -Each individual in the smaller vessel fleet was guarantied minimum quota holdings of 7t. The larger vessels chose to set no minimum.
>
> -The best two years of catch history for each stock for the four year period 1986-1989 was used to share the quotas between individuals. Dropping the worst two years removed the penalties from those individuals who suffered bad luck or breakdowns and generally distributed the IQ's more evenly.[5]

Determining how to distribute quotas is a difficult task, and basing the allocation formula on reported catch can present some significant problems. The fishermen in the Scotia-Fundy region have been known to partake in illegal fishing activities and misreport catches. While the fishermen have hurt themselves by doing so, nonetheless historic catch data will be inaccurate, making it an imperfect basis for the allocation formula. At the same time, a setting of a minimum quota

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[5]Personal correspondence with Paul MacGillivray, Department of Fisheries and Oceans, Halifax, Nova Scotia, 14 March 1991.

holding of 7 tons could bring with it inefficiency problems. There is a good chance that there may be some vessels in the Scotia-Fundy region that have capacities smaller than 7 tons. This would encourage those with small vessels to increase their fishing capacity to take advantage of the increase, but the build up of capacity was the very development the authorities were trying to avoid. On the other hand, those with smaller vessels may choose not to take advantage of the increase. If the quotas are not transferable then there will be fishermen who will not be using their quotas to the fullest, and the excess could be put to more efficient use in the hands of someone who has fishing capacity that is not being fully utilized.

This discussion raises the question as to whether the individual quotas should be transferable. Three months into the program, the IQ's are transferable but only on a temporary basis. If the managers of the program decide to maintain their transferability feature then the situation noted above will not pose a problem. The fishermen could sell the unused shares of their quotas to those participants who want to increase their harvest rights. At the same time, transferability brings with it a potential for concentration of quota ownership. Such a development would constitute a mixed blessing. From the individual fisherman's point of view, it could pose a threat. If a large firm were able to acquire a substantial amount of quota it would threaten the livelihood of the small individual fishermen who would no longer be able to maintain a competitive cost position. Further, the acquisition of quota that would result in one fisherman or company (such as National Sea) holding a large percentage of the total could potentially threaten the viability of a fishing community itself. As these companies become more concentrated there would be a need for fewer fishing centers in the region, with obvious consequences for the small community On the other hand, concentration would have its benefits from an efficiency point of view. The larger companies would likely be able to harvest their quotas of fish at lower cost than is presently the case.

If it is decided that these quotas should no longer be transferable, then there will be a problem of what to do with the quota when the owner passes away or decides to retire. The difficulties that can arise with this kind of policy have been discussed in the first section of this chapter.

Before a system of IQ's can be implemented, there needs to be a credible catch monitoring system put in place. The catch monitoring systems existent under old management policies would not be sufficient under the new quota program. Before IQ's, the catch of fish was attributed to the fleet as a whole; specific catch totals coming from individual boats were not important. Under IQ's it is important to know what quantity of fish came from which boat to ensure that the fisherman does not go over his limit. With this system there will be incentives for people to misreport their catches so that they can keep participating in the fishery. Before the individual quotas program was introduced, catch monitoring was dependent on sales slips for its main source of information. With the introduction of the program, these slips had to be completely redesigned to go along with changes in the Fisheries Act. DFO officers will now have to be more involved in surveillance of the fishermen and watch for discrepancies in the slips. The new IQ program has the potential to be successful, but it must be properly and strictly enforced or it will be useless.

A Certified Weighmaster program was introduced in the Scotia-Fundy region to help in the surveillance of the fishermen. Under this system the fisherman must tell a DFO officer where and when he will be making a landing so that a weighmaster will be there to weigh the catch. This will assist in the keeping of accurate records, but not without difficulties. If weighmasters cannot be available at all times and locations, there may be inconveniences and lost time suffered by the fishermen who must wait or go out of their way to find a weighstation. An even bigger problem is likely to develop later this summer when it will be necessary to assign responsibility for the costs of the weighmaster program. To date it has been paid for with government "seed money", but those funds will soon be exhausted. It will then be up to the industry to pay, and such a development will certainly bring opposition from the fishermen.

Even though the individual quota program has its problems, it does offer fishermen many advantages. Since there is no longer any pressure placed on fishermen to compete with each other for the best stocks, they can now fish when it is convenient. This allows them to do their fishing when the catch rates and prices are at their best levels and permits the fishermen to plan their fishing time around other jobs and other fisheries. Safety and comfort will be increased as fishermen will no longer feel that they must go out in bad weather to get the principal species before they are taken by others. A system of individual quotas also brings about possibilities for a reduction in fuel and operating costs because fishermen are no longer as concerned with speed and they will also have more time available to do their own repairs instead of feeling rushed to get things fixed. Since the most competitive gear and boats that are desired under an open access fishery are no longer necessary, there will be increased cost savings as fishermen will only need to invest in the minimum amount of gear.

While the emphasis has been changed from controls on inputs to output individual quotas, the controls necessary for conservation (mesh size restrictions, area closures) have also been retained. This should give the fishery the necessary balance between preservation of the stocks and maintaining the catch rates necessary for economic efficiency.

CHAPTER V

CONCLUDING REMARKS

The Canadian fisheries authorities are faced with a difficult task. They must provide a management plan for the fishery that will allow the fishermen to obtain the optimum harvest from the resource, while at the same time ensure the stocks are conserved in such a way that they will be abundant for future generations.

The difficulties in achieving these goals simultaneously have become evident in the Scotia-Fundy groundfish fishery. As a result of the difficulties facing this industry, a new management plan has been put forward. Many of the recommendations of the Report of the Scotia-Fundy Groundfish Task Force focused on fleet management, especially with the mobile gear fishermen, since they have the greatest impact on the resource in terms of the overexploitation and mismanagement of the stocks. The development of a transferable quota program for these fishermen was seen as being a positive step toward addressing the management problems of the Scotia-Fundy Region.

The individual quota system has been in effect in the Scotia-Fundy Region for only three months. .To date there have been few serious problems and most of the fishermen agree that this step was needed. While this management scheme will not bring results overnight, it will lead to a more efficient industry with positive consequences for both the livelihood of the fishermen as well as the conservation of the groundfish stocks.

The new management scheme has the potential to be very successful in that it also maintains the regulations necessary for conservation of the stocks, but at the same time it must be supported by a credible catch monitoring system and method of enforcement. Without increased surveillance and enforcement, the individual quota program will not achieve the stated goals.

In terms of what can be done in the future, it would be useful to begin new research on methods of enforcement since this plays such a crucial role in determining the success of the individual quota program. At the same time, additional work on fish population dynamics may help the Canadian fisheries authorities to develop new programs to complement the ones already in existence. This should aid the fishery in reaching a balance between the preservation of the stocks and the maintenance of catch rates necessary for economic survival for those involved in the Scotia-Fundy groundfish fishery.

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