An evaluation of the Canadian 200-mile fisheries zone: benefits, problems and constraints

by

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December, 1991

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements of the degree of Doctor of Philosophy

ABSTRACT

This thesis evaluates the impact of the Canadian 200-mile fisheries zone from biological, economic and social perspectives. The factors and events leading to the 200-mile zone are examined. The Canadian management regime post-extension is described. Canada derived significant benefits from the 200-mile zone including increased management authority over a vast area with major fish resources, the displacement of foreign fisheries, the development of Canadian fisheries in areas and for species not previously utilized by Canada, and the opportunity to rebuild overfished fish stocks. However, various problems and constraints have led to continued fisheries instability. These include:

1) Natural resource variability,
2) The common property nature of the resource and resultant overcapacity,
3) Fluctuations in market conditions,
4) Heavy dependence on the fisheries in isolated coastal communities, and
5) Recurrent conflict among competing users and conflicting objectives for fisheries management.

Despite Canada's abundant marine fishery resources, various combinations of these factors have contributed to a recurrent boom-and-bust pattern in many marine fisheries. Extended jurisdiction did not provide a panacea for the problems of the fisheries sector. Continued periodic fluctuations in Canada's marine fisheries and demands for government assistance can be expected unless viable alternative economic opportunities can be developed in the coastal regions.

RÉSUMÉ

Cette thèse porte sur l'évaluation des incidences biologiques, économiques et sociales de la création de la zone canadienne de pêche de 200 milles. On y examine aussi les facteurs et les événements qui ont mené à la création de cette zone et on décrit le régime canadien de gestion appliqué après sa création. La création de cette zone a eu d'importants avantages pour le Canada, y compris un plus grand pouvoir de gestion visant une vaste région abritant d'importantes ressources halieutiques, le réaménagement des activités de la pêche étrangère, le développement de pêches dans des zones auparavant non exploitées par des Canadiens, l'exploitation d'espèces sous-utilisées ainsi que la possibilité de rétablir des stocks surexploités. Toutefois, divers problèmes et contraintes font que le secteur des pêches est encore instable. Ceux-ci comprennent:

1) la variabilité intrinsèque à la ressource,
2) l'universalité d'accès à la ressource et la surcapacité de pêche résultante,
3) les fluctuations des marchés,
4) la forte dépendance des communautés côtières isolées envers la pêche, et
5) les différends fréquents entre les exploitants de la ressource, ainsi que les objectifs souvent contradictoires de la gestion des pêches.

Malgré les abondantes ressources halieutiques marines du Canada, les effets combinés de ces facteurs ont donné lieu à une alternance de fortes expansions et de récessions dans de nombreux secteurs de la pêche maritime. La création de cette zone de pêche de 200 milles n'a pas été une panacée pour le secteur halieutique canadien. A moins d'une diversification économique viable des régions côtières, on peut s'attendre au maintien des fluctuations périodiques de la pêche maritime canadienne et à des demandes d'aide gouvernementale.

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STATEMENT OF CONTRIBUTION TO ORIGINAL KNOWLEDGE

I believe that this study has contributed to original knowledge in several ways. It represents the first comprehensive interdisciplinary evaluation of the impact of the Canadian 200-mile fisheries zone, examining the effects of the 200-mile fisheries zone from biological, economic and social perspectives. The study concludes that, while the 200-mile zone brought significant benefits to Canada, it did not resolve the underlying fisheries management dilemma at the root of the recurrent problems evident in the fisheries sector.

The study postulates that the crux of this dilemma can be found in the nature of the fisheries system, which is characterized by:

1) Natural resource variability, often environmentally induced;
2) The common property nature of the resource which leads to overcapacity in both harvesting and processing;
3) Fluctuations in market fluctuations similar to, but not necessarily in tandem with, resource fluctuations;
4) Heavy dependence on the fisheries in isolated coastal communities with few alternative employment opportunities;
5) Heavy dependence on government support programs such as Unemployment Insurance;
6) Tremendous diversity among fisheries;
7) Recurrent conflict among competing user groups;
8) Conflicting objectives for fisheries management;

9) The migratory nature of fish stocks necessitating bilateral and multilateral management of transboundary stocks; and
10) The necessity to manage despite uncertainty in scientific advice.

Other studies have examined various aspects of these factors. This study is original in illustrating how various combinations of these factors have contributed to an underlying roller-coaster pattern of boom and bust in many of Canada's commercial marine fisheries.

This study shows that the 200-mile fisheries zone has not removed the underlying uncertainty and instability. It predicts that some degree of instability will continue to be a fundamental characteristic of Canada's marine fisheries. It also argues that the creation of a more resilient fishing industry cannot be achieved through fisheries management initiatives alone. Fisheries policy is inextricably linked to regional economic development policy.

ACKNOWLEDGEMENTS

I wish to thank the Canadian Department of Fisheries and Oceans for allowing me the time and support to undertake a major research project on marine fisheries management in Canada. This thesis is one product of that research.

Numerous staff of DFO both at Ottawa Headquarters and in the Regions provided assistance in accessing records, files, historical data and internal reports of the Department. A special thanks is due to the staff of the DFO Library in Ottawa.

I wish to thank, in particular, Henry Lear for his invaluable assistance in retrieving historical information from many different sources. Ronnie Sanford and Colleen Meloche checked references and typed and retyped the manuscript.

I would like also to thank Dr. Rob Peters of the McGill Department of Biology for his thoughtful advice as thesis supervisor, and the members of my supervisory committee for providing suggestions to improve the manuscript. Dr. John McNamara, Director of the Ad Hoc History and Philosophy of Science Program, provided vital guidance and encouragement when this project was still in the crucial embryonic stage. Dr. Peter Meyboom, former Deputy Minister of Fisheries and Oceans, first suggested to me the idea of using my research on marine fisheries management in Canada as the basis for a Ph. D. program.

Finally I would like to thank my wife Loretta for her patience, forbearance and advice.

CHAPTER 1

INTRODUCTION

The 1960s, 1970s and 1980s were decades of dynamic change in the management of Canada's marine fisheries. Domestically, the relatively laissez-faire regulatory regime of the post-Second World War era gave way to greater government intervention in the management of the resource and its harvest. Major changes included the limitation of entry into the fishery to control fishing effort and direct controls on the amount of catch in order to limit fishing mortality. Perhaps the most significant fisheries event was the implementation by Canada of a 200-mile fisheries zone in 1977.

Recognizing that existing international management mechanisms were inadequate, Canada proclaimed a 12-mile territorial sea in 1971 and declared the Gulf of St. Lawrence, the Bay of Fundy and certain areas on the Pacific coast as internal Canadian waters. It entered into phase-out agreements with various countries which had fished historically in the Gulf of St. Lawrence. These measures proved insufficient to protect stocks of interest to Canada. On the Atlantic coast, several major groundfish stocks extended to the edge of the continental shelf. On the Pacific coast, Canadian salmon migrated vast distances and were intercepted in fisheries on the high seas. During 1972-77, Canada worked within international fisheries commissions such as the International Commission for the Northwest Atlantic Fisheries to reduce fishing pressure, in an attempt to arrest the decline in the resource. At the same time it became a major proponent, in the Third UN Law of the Sea Conference (UNCLOS III), of extended jurisdiction for coastal states over renewable resources adjacent to their coasts. By 1976, consensus had been achieved on the concept of a 200-mile

exclusive economic zone for coastal states. Canada, in concert with many other countries, proclaimed a 200-mile fishing zone effective January 1, 1977.

Canada's decision to extend its fisheries jurisdiction to 200 miles effective January 1, 1977, on the Atlantic and Pacific coasts and March 1, 1977, in the Arctic, represented part of a worldwide movement to enclosure of a substantial portion of the global oceans commons. The move to a 200-mile limit for fisheries jurisdiction during the 1970s is perhaps the most significant event in the history of world fisheries. It marked the transition from a regime where states could manage fisheries within only a small band of 3 to 12 miles from their coasts to a situation where coastal states are responsible for managing substantial portions of the world's marine fish resources.

Expectations were high that the 200-mile fisheries zone would provide a solution to the myriad problems of Canada's marine fisheries. Even though the Atlantic fishing industry had just emerged from a major crisis during the 1974-77 period, a wave of post-extension euphoria about the potential benefits of the new zone led to a build-up of excessive harvesting and processing capacity. The fishing industry was again plunged into crisis during 1980-1982, as part of a nation-wide recession, despite a resource recovery.

Favourable market conditions contributed to an industry resurgence in the mid-1980s. The Atlantic groundfish industry faced crisis conditions again in 1989 and 1990, as the allowable harvests for some stocks decreased and scientific assessments of the status of certain stocks were adjusted downwards.

This was just another manifestation of the recurrent boom-and-bust pattern to which the marine fisheries, particularly those on the Atlantic coast, were prone. While Canada gained significant benefits from the 200-mile zone, extended jurisdiction did not provide a panacea. Canada's

marine fisheries continue to be plagued by problems of resource variability, market fluctuations, and excess harvesting and processing capacity.

The purpose of this dissertation is to evaluate the impact of the Canadian 200-mile fisheries zone on Canadian marine fisheries policy, management practices and the relative prosperity of the fishing industry. My thesis is that, while the 200-mile fisheries zone brought significant benefits to Canada by providing an increased scope for Canada to manage the fisheries off its coasts in accordance with national objectives, it has not resolved the underlying fisheries management dilemma which is at the root of the problems confronting the fisheries sector.

The crux of the fisheries management dilemma can be found in the nature of the fisheries system which encompasses the resource, the harvesting, processing, and marketing sectors, and the people involved in all facets of the fishing industry. This system is characterized by:

1. Natural resource variability, often environmentally induced;
2. The common property nature of the resource which leads to overcapacity in both harvesting and processing;
3. Fluctuations in market conditions similar to, but not necessarily in tandem with, resource fluctuations;
4. Heavy dependence on the fisheries in isolated coastal communities with few alternative employment opportunities;
5. Heavy dependence on government support programs such as Unemployment Insurance;
6. Tremendous diversity among fisheries;
7. Recurrent conflict among competing user groups; and
8. Conflicting objectives for fisheries management.

This fisheries management dilemma has resulted in a recurrent boom-and-bust pattern, recurrent crises, and recurrent demands for government financial assistance. Despite the benefits provided by the 200-mile fisheries zone, the underlying causes of the fisheries management dilemma remain.

I begin with a profile of Canada's fisheries to set the context for the impact of the 200-mile fisheries zone on Canada's marine fisheries. In the following chapters, I examine first the factors and events leading to Canada's extension of fisheries jurisdiction to 200 miles and the nature of the post-extension Canadian management regime, and then evaluate the impact of the 200-mile zone in terms of benefits obtained and problems and constraints. Finally, I examine why the 200-mile fisheries zone was not a panacea for the myriad problems confronting Canada's marine fisheries and describe the characteristics of the fisheries system which have contributed to the recurrent boom-and-bust pattern and recurrent demands for government financial assistance. I conclude that, despite the benefits provided by Canada's management of the fish resources within its 200-miles fisheries zone, Canada's marine fisheries will continue to be subject to periodic fluctuations and demands for government assistance unless viable alternative economic opportunities can be created in the coastal regions. The failure of various regional economic development initiatives of the last three decades suggests that the latter possibility is doubtful. I predict a continuation of the boom-and-bust pattern moderated somewhat by fisheries management interventions.

In undertaking this examination, I have drawn upon published literature, data records and files of the Department of Fisheries and Oceans and some interviews with individuals involved in fishing and fisheries management. As an active participant in events relating to the establishment and implementation of the 200-mile zone and the management of

Canada's fisheries in the post-extension era, I have also drawn upon my own observations of events during the period 1968 to 1990.

CHAPTER II

CANADA AND THE FISHERIES

1. INTRODUCTION

Historians tell us that the fishery attracted the first Europeans to what is now Canada's Atlantic coast. It influenced patterns of settlement and was a vital part of commerce from the 16th century onwards. Fish and fishing were an integral part of the life style of Canada's native peoples for thousands of years prior to the arrival of the Europeans.

To today's city dweller in Canada's large urban areas, such as Toronto and Montreal, the fishery often appears to be a relict of the past, and a drain on, rather than a contributor to, the national economy. To many Canadians who inhabit more than a thousand communities along Canada's Atlantic, Pacific, and Arctic coasts, the fishery provides employment and income in areas where alternative employment opportunities are few. To these people, the fishery is more than a source of income. It is a way of life.

2. THE HISTORICAL CONTEXT

Canada's fisheries began with the capture of fish for food and trade by Canada's aboriginal peoples. The commercial marine fisheries in Canada began with the discovery of Newfoundland by John Cabot in the summer of 1497 on his little ship the Matthew. Despite this, it was not the English who began to exploit the new overseas fishery. Their interests at that time were focused on Iceland. The French and the Portuguese commenced and developed the fishery in the Northwest Atlantic during the early 1500s (Innis, 1978).

It is beyond the scope of this thesis to describe the evolution of Canada's commercial marine fisheries from 1500 to the present day. For a brief account of historical

developments on both coasts, see Gough (1988). For a more detailed account of the development of the Atlantic coast fishery over several centuries, see Harold Innis' treatise "The Cod Fisheries: The History of an International Economy" (Revised Edition, 1978). The early fishery on the Atlantic coast by European-based fishermen was for cod. Cod was king on the Atlantic coast for centuries and remains a key component of the Atlantic fisheries in the late 20th century.

During the 17th and 18th centuries France and England vied for dominance of the fisheries of the New World, with England finally prevailing in the 19th century. Following the withdrawal of the French, settlers in Newfoundland and Nova Scotia fished in small open boats from shore.

On the Pacific coast, a single species, the sockeye salmon, dominated the early history of the commercial fishery which commenced much later than on the Atlantic coast. Native populations had concentrated at locations on the rivers near the salmon spawning grounds. When the fur trade reached the Pacific coast in the early 1800s, these locations served as bases for this trade. The expansion of B.C.'s population following the gold rush in the 1850s provided a local market. Commercial canning of salmon began on the Fraser River around 1870 and on the Skeena River shortly thereafter.

With the completion of the transcontinental railway, access was gained to markets for salmon in eastern Canada and the United States. In 1887 cold storage plants for salmon were built on the Fraser River. This provided a basis for expansion both of the salmon fishery and the halibut fishery. The halibut fishery in turn required bait which led to the development of a fishery for herring (Gough, 1988).

Around the beginning of the twentieth century, a number of important changes occurred in the Canadian fisheries. The gasoline engine began to be used in the small-boat fisheries. Purse seining began in the British Columbia salmon and herring fisheries. In 1908 otter trawling was introduced to the

Atlantic coast. This latter development was opposed by inshore fishermen who felt that an expansion in the number of otter trawlers would impact adversely on their sector of the fishery. In response, otter trawling was severely restricted, the intent being to maintain the largest possible labour force in the fishery. The trawler fleet was restricted to 3 or 4 vessels during the 1930s. This retarded the development of the Atlantic fishery, in particular, the growth of a year-round fresh and fresh frozen fishery.

The Second World War intensified the demand for fish products. This kept alive the salt fish industry. A filleting and freezing industry was established in Newfoundland. Restrictions on the use of otter trawlers were relaxed.

New technology such as radios, radar and sonar were adopted by the fishing fleets. Governments, both federal and provincial, placed increased emphasis on fisheries development, following the 1944 Report on the Atlantic Sea Fishery by Stewart Bates (Bates, 1944). Emphasis was placed on modernization and expansion of the Atlantic fisheries. More vessels and plants were built with government assistance. New fisheries were developed for species such as redfish, flounder, scallops, shrimps and crab.

With the development of refrigeration in transportation and storage facilities, the demand for frozen fish increased. The groundfish industry switched to frozen fish production. Several vertically integrated companies began to dominate the groundfish fishery and subsequently extended into the lobster, scallop and herring fisheries.

This expansionist trend came to an end in the late 1960s with the realization that the fishery resources were finite. Some stocks had been overfished domestically, e.g. B.C. herring. The build up of the foreign fishery on the Atlantic was reducing the abundance of important groundfish stocks. In just 25 years Canada's marine fisheries had gone from a

situation of underdevelopment to one of overcapacity. From the mid - 1960s onward the federal government began to wrestle with the twin problems of overfishing (conservation) and overcapacity (economic viability). The emphasis shifted from developmental assistance to regulatory control to address the problems of overfishing and overcapacity. The late 1960s marked the transition to a new era of modern-day fisheries management, involving the application of new regulatory techniques, e.g. limited entry licensing and catch quotas, the intensification of conflict among various groups as each fought for a greater share of the fisheries pie, and a greater involvement by government in determining who could fish, where, when, and in setting the terms and conditions under which fishing could be conducted.

3. AN OVERVIEW OF TODAY'S CANADIAN FISHERIES

Canada has one of the world's largest fishing zones, the longest coastline, and an abundance of freshwater lakes and rivers. It is one of the world's top twenty fishing nations in terms of fish production. From 1974 to 1988, Canada ranked 16th in catch in 11 years out of 15. This placed it well behind the top four fishing nations, Japan, the USSR, China and the USA, but in a league with South Korea, Iceland, Mexico and Spain. Canada's share of the world catch was generally less than two percent through the 1970s and 1980s. Canada's reputation as a fishing nation derives from its ranking as the world's number one fish exporter in terms of value from 1978 to 1987 (FAO Statistics). Most of Canada's fish production is exported.

Canada has important fisheries on both the Atlantic and Pacific coasts and in the inland lakes. Overall, the fishery has accounted for only about one percent of the value added in commodity-producing industries in Canada since the 1970s. Fishermen and plant workers accounted for only three percent

of Canadian employment in those same industries through the 1980s.

On a regional basis, however, the fishery makes a much more significant contribution, particularly in the Maritime provinces and Newfoundland (Table 2-1a) to the value - added in commodity - producing industries. In employment terms, the regional impact is even more striking in Newfoundland, Prince Edward Island and Nova Scotia (Table 2-2b). In 1985, 72.0% of the employment in goods producing industries in Newfoundland was generated by the fisheries, compared with about one percent in Quebec and in the Prairie Provinces and only a fraction of one percent in Ontario.

These figures illustrate the substantial dependence on the fisheries as a source of employment and income in the Atlantic provinces, particularly in Newfoundland, P.E.I. and Nova Scotia. At the community level fisheries activities are even more significant (Kirby, 1982; Poetschke, 1984; also see Chapter VI, Section 6.1.1)

In Newfoundland, more than one half the population live in small fishing communities. Of the 600,000 people in the Atlantic who live in fishing communities, about 200,000 live in communities where fishing activity is the principal, if not the only, employer.

The situation in British Columbia with respect to regional and community dependence on fishing is quite different from that on the Atlantic coast. In British Columbia, the fisheries are relatively less important to the overall economy than in the Atlantic provinces.

In the Arctic, native peoples depend upon fish for food and income in isolated communities scattered across the northern part of Canada. Freshwater fisheries are important to native communities throughout Canada.

Table 2.1(a) Contribution of fishing and fish processing to value added in commodity-producing industries, 1986 (Values in million dollars)
Source: Statistics Canada. Catalog 15-203. 1990 Provincial Gross Domestic Product by Industry.

Province	Value Added				
	Fishing	Fish Processing	Sub-total	All Commodity Producing Industries	Fisheries as % of Total
Nova Scotia	292.3	246.6	538.9	3,416 3	15 8
New Brunswick	69.3	82.3	151.6	3,029.8	5.0
P.E.I.	41.4	23.4	64.8	406.5	15.9
Quebec	68.0	40.8	108.8	36,011.6	0.3
Newfoundland	141.8	261.3	403.1	2,014.0	20 0
Ontario	35.3	***	***	67,498 9	***
Prairie Provinces	19.3	***	***	33,844.9	***
British Columbia	264.5	165.6	430.10	15,557.5	2.8
Yukon and NWT	1.6	***	***	850.2	***
Canada Total	933.4	843.4	1,776.8	162,629.7	1.1

*** = Confidential

Table 2.1(b) Employment in the fisheries compared with employment of all goods-producing industries, 1985 Employment reported in thousands)
Source: Statistics Canada. Catalog 35-250. 1990. Fish Products Industry

Province	Fisheries				
	Fishermen	Fish Plant Workers	Sub-total	Goods Producing Industries	Fisheries as % of Total
Newfoundland	27	9	36	50	72.0
Nova Scotia	14	7	21	90	23.3
New Brunswick	7	4	11	68	16.2
Prince Edward Island	4	1	5	15	33.3
Quebec	6	2	8	818	1.0
Ontario	2	-	2	1452	0.1
Prairie Provinces	6	-	6	612	1.0
British Columbia	18	4	22	320	6.9
Canada Total	84	27	111	3425	3.2

Note: The numbers of fish-plant workers obtained from Statistics Canada reflect only the numbers of plant workers in the larger fish plants with more than 200 workers.

Canada's fisheries resources are both varied and abundant. The diversity of the fisheries resources is as striking as the fisheries which exploit these resources. These resources are generally classified into two major groupings - "finfish" and "shellfish". Finfish include the major marine species and most commonly utilized freshwater species. Shellfish include invertebrate species such as crustaceans, e.g. lobsters and crabs, and molluscs, e.g. clams, oysters and squid. Species are also commonly grouped according to their preferred habitat and life history patterns. Both finfish and shellfish for example, are grouped into littoral, demersal (or groundfish), and pelagic species.

Littoral species are those which live inshore, within the 50-60 fathom contour adjacent to the coastline. Crustaceans and molluscs, with the exception of scallops, shrimp and squid, generally fall into this category. Groundfish species live near the bottom. Pelagic species spend a large part of their life cycle in midwater or near the surface of the open ocean. Groundfish species include both common finfish such as cod, haddock, and flatfish as well as some crustaceans (e.g. crabs), and a mollusc (scallops). The major pelagic species are all finfish (e.g. herring, mackerel, tuna) except for squid. Redfish do not fit neatly into either of these categories but are considered to be groundfish.

Anadromous species constitute the other major category. These spend much of their adult life in the ocean but swim upstream into freshwater to spawn. The five species of Pacific salmon, which are anadromous, support extremely valuable fisheries in British Columbia.

Canadian commercial fisheries landings and landed value generally increased from the mid - 1970s onward, with some decrease in the early 1980s. The rate of growth slowed in 1988 and landings and landed value dropped slightly in 1989. Total Canadian commercial landings increased from 969,000 tons in 1974 to 1.44 million tons in 1979, dropped to 1.34 million

tons in 1980, then increased again to 1.43 million tons in 1981. In the early 1980s, landings decreased to 1.28 million tons in 1984. Thereafter landings increased to a peak of 1.64 million tons in 1988. The 1988 landings were 69% greater than the low point of 1974, and 10% above the 1984-88 five year average (Figure 2-1). However, 1988 landings were only 13% higher than the 1960s high of 1.45 million tons in 1968, just prior to the decline in the Atlantic groundfish fishery in the early 1970s under the pressure of foreign overfishing (Table 2-2).

The nominal landed value of the Canadian commercial fisheries increased dramatically during the 1980s, more than doubling between 1980 and 1987. The major increase occurred during 1985-1988. In 1988, the landed value was $1.6 billion,down slightly from 1987, but up 22% from the 1984-88 five year average (Figure 2-1). Preliminary statistics indicate that the value of commercial landings in 1989, at $1.4 billion, was about 14% less than in 1988. The drop in landed value has been attributed to lower prices for groundfish following a market boom during 1985 to 1987 (Marketing Division, DFO, Personal Communication).

The total value of fishery exports in 1988 was $2.7 billion, approximately the same as in 1987. Export value increased from $600 million in 1976 to $1.1 billion in 1980, hovered around $1.3 billion from 1981 to 1984, and then doubled between 1984 and 1988 reflecting the market boom during the 1985-88 period.

With exports and imports valued at $2.701 billion and $737 million respectively, Canada's net balance in international fishery product trade was $1.964 billion in 1988.

Fig. 2.1 Canadian commercial fish landings in quantity and value from 1976 to 1988.

Source: DFO Statistics, Ottawa

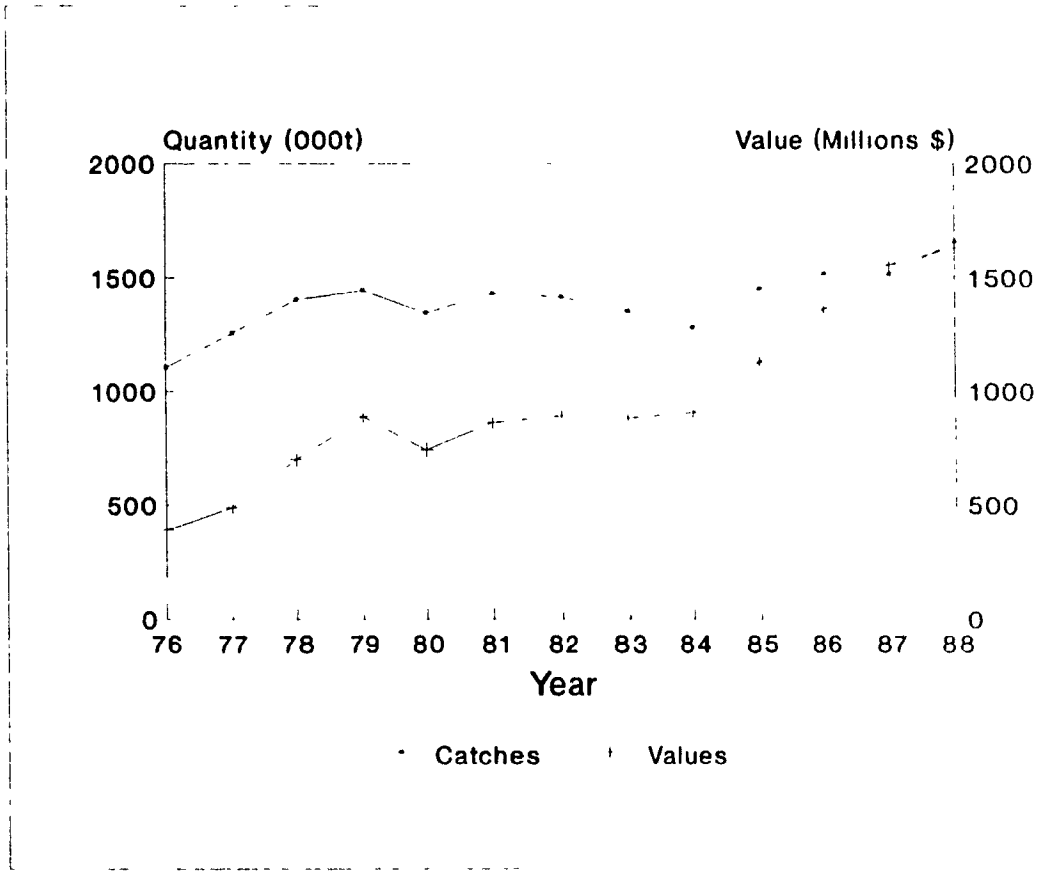

Quantity (000t)
Value (Millions $)
2000
1500
1000
500
0
2000
1500
1000
500
0
76
77
78
79
80
81
82
83
84
85
86
87
88
Year
Catches
Values

Table 2 2 Canadian Commercial Fish Landings and Landed Values 1966-1988
(Quantity in Metric Tons and Value in 000$)

	ATLANTIC		PACIFIC		FRESHWATER		CANADA TOTAL	
	Q	V	Q	V	Q	V	Q	V
1966	995,290	95,859	271,540	60,642	55,051	14,853	1,321,881	171,354
1967	1,040,667	98,059	159,812	48,959	48,434	11,831	1,248,913	158,849
1968	1,267,539	110,617	131,145	57,268	52,231	12,957	1,450,905	180,842
1969	1,207,549	114,828	88,418	47,381	54,547	15,660	1,350,534	177,869
1970	1,173,959	125,685	117,021	60,255	42,933	13,237	1,333,913	199,177
1971	1,094,744	128,803	113,368	58,588	41,511	13,132	1,249,623	200,523
1972	931,234	141,410	163,317	75,128	42,458	15,840	1,136,009	232,378
1973	888,478	167,553	183,827	130,409	45,529	19,095	1,117,834	317,057
1974	781,003	163,614	141,141	100,976	47,007	18,241	969,151	282,831
1975	805,345	184,524	132,916	79,681	42,479	20,944	980,810	285,149
1976	880,892	218,665	180 942	141,851	39,667	24,146	1,101,461	384,662
1977	1,003,074	282,536	204,310	166,250	47,289	31 091	1,254,713	479,877
1978	1,153,231	408,466	198,743	249,729	47,571	32,959	1 399,505	691,154
1979	1,237,702	499,558	155,216	327,224	49 152	46,868	1,442,130	873,650
1980	1,156,088	501,902	129,946	179,746	54,297	48,352	1,340,311	730,000
1981	1,194,557	550,177	183,117	232,976	49,956	57,125	1,427,650	849,278
1982	1,197,632	581,608	157,813	235,774	57,743	58,847	1,413,218	876,229
1983	1,108,439	617,394	191,543	203,011	48,818	48,464	1,348,800	868,869
1984	1,065,205	595,493	169,118	238,404	43,424	61,505	1,277,797	895,402
1985	1,187,937	683,044	213,844	371,946	48,078	58,361	1,449,849	1,113,351
1986	1,245,280	874,470	222,417	395,587	45,270	77,180	1,512,967	1,347,237
1987	1,265,430	1,111,478	251,346	431,835	50,800	88,500	1,567,566	1,631,813
1988	1,324,297	1,004,179	265,318	515,427	52,000	91,000	1,641,645	1,610,606

Source DFO Statistics, Ottawa

In 1988, 95,000 fishermen were involved in Canada's commercial marine fisheries. Approximately 66,000 fishermen were engaged in the Atlantic commercial fisheries, 21,000 in the British Columbia commercial fisheries and about 8,000 in the freshwater fisheries. According to Statistics Canada, the number of persons employed in fish processing fluctuated around 25,000 from 1982 to 1985. Because the numbers of fish plant workers reported by Statistics Canada include only the numbers of plant workers in the larger fish plants, i.e. those with more than 200 workers, these underestimate the actual number of fish plant workers in Canada. According to DFO statistics, the total number of fish plant workers in 1988 was 40,000. Approximately 33,000 were employed in the Atlantic fisheries, 6,000 in British Columbia and 1000 in the freshwater fisheries.

Canada's commercial fisheries provide employment for about 135,000 individuals in the harvesting and processing sectors combined. This number seems insignificant when viewed in terms of national employment statistics. However, on a regional basis this employment is very important to more than 1300 coastal communities. In a great many of these, fishery - related employment determines whether or not a community survives or disappears.

The harvesting sector of Canada's marine fisheries is incredibly diverse and difficult to portray on a national basis. A multiplicity of types and sizes of fishing vessels and types of fishing gear are used to harvest the wide diversity of species which contribute to Canada's commercial marine fisheries. There is as much difference between the small-boat inshore cod fishery using cod-traps in Newfoundland and the dragger fishery for scallops on Georges Bank as there is between the Gulf of St. Lawrence crab fishery by a midshore fleet using crab traps and the purse seine or troll fishery for Pacific salmon in British Columbia. The fishing vessels used range all the way from a small open-boat powered by an

outboard motor in the lobster fishery, which fishes on day trips, to the large powerful offshore otter trawler, which goes to sea for up to two weeks before landing its catch for processing. Modern factory freezer trawler technology is used in the northern shrimp fishery off northeast Newfoundland-Labrador. The type of vessels and gear used varies enormously among fisheries across Canada.

Geographically, there are three major fisheries in Canada - the Atlantic, the Pacific and freshwater. Over the past two decades the Atlantic fisheries have generally accounted for about 80% of the total commercial landings in Canada. The Pacific share of total landings fluctuated around 15%.

In terms of landed value, the highly valuable Pacific salmon and herring fisheries shift the balance somewhat toward the Pacific. The Atlantic contribution to the total Canadian landed value has been around 60% during the past two decades. The Pacific share of landed value has been around one-third of the Canadian total. In 1988, the Atlantic accounted for 66% of the value of fishery products, the Pacific 30% and the inland fisheries 5%.

Thus the Atlantic and Pacific fisheries dominate the Canadian commercial fisheries in landings, landed value and value of fishery products. Because of differences in values of particular species and products, the Pacific share of landed value and value of fishery products is higher than would be indicated by the relative share of landings.

3.1 The Atlantic Fisheries

The groundfish fishery remains the dominant fishery on the Atlantic in landings and value (55.4% of volume and 37.1% of value). There are also very important shellfish fisheries, particularly lobsters, crab, scallops and shrimp (only 15% of volume in 1988 but 53% of value). Pelagic fisheries, principally for herring and capelin, are significant in volume but less so in value (29.5% and 10% respectively in 1988). Of

the three major species groupings, groundfish constitute more than half the volume of landings and shellfish constitute more than half the landed value of the catch.

The relative contribution of various species to the Atlantic coast catch in volume and value in 1988 is shown in Figures 2-2 and 2-3. Cod is dominant in volume (35.3%). Groundfish other than cod account for 20.1%. Herring ranks second overall in volume at 19.8%. Capelin is second among the pelagic species in volume at 6.8%. Scallops account for 5.8% of the overall volume and 38.6% of the shellfish fishery value. The principal scallop fishery is the offshore fishery on Georges Bank.

In terms of landed value, lobster and cod are the dominant species (26.3% and 23.8% respectively). The next most valuable species are crabs and scallops (9.9% and 8.5% respectively).

This is a thumbnail sketch of the situation prevailing in 1988. There have been significant shifts in the relative contribution of various species and species groups to the total Atlantic catch and landed value over time.

Differences in the relative abundance of the various species along the Atlantic coast contribute to significant differences in volume and landed value among the five Atlantic provinces, just as there are differences between the Atlantic and Pacific fisheries. As indicated by the contribution of fisheries to the value-added by commodities-producing industries on a provincial basis, Newfoundland and Nova Scotia are the most important Atlantic provinces in fisheries terms. Although Prince Edward Island ranked ahead of Nova Scotia in terms of the relative contribution of the fisheries to the provincial economy, Nova Scotia ranks as one of the two chief fishing provinces on the Atlantic.

Fig. 2.2 Volume of the 1988 Atlantic coast Canadian catch by major species.

Source: DFO Statistics, Ottawa

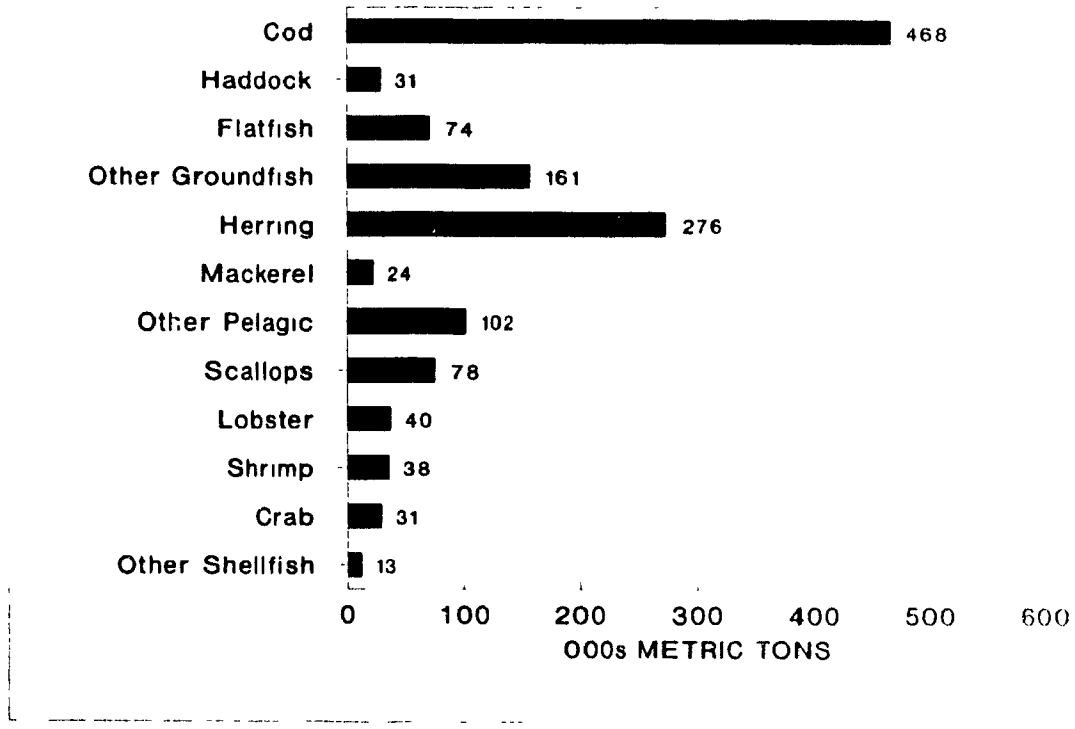
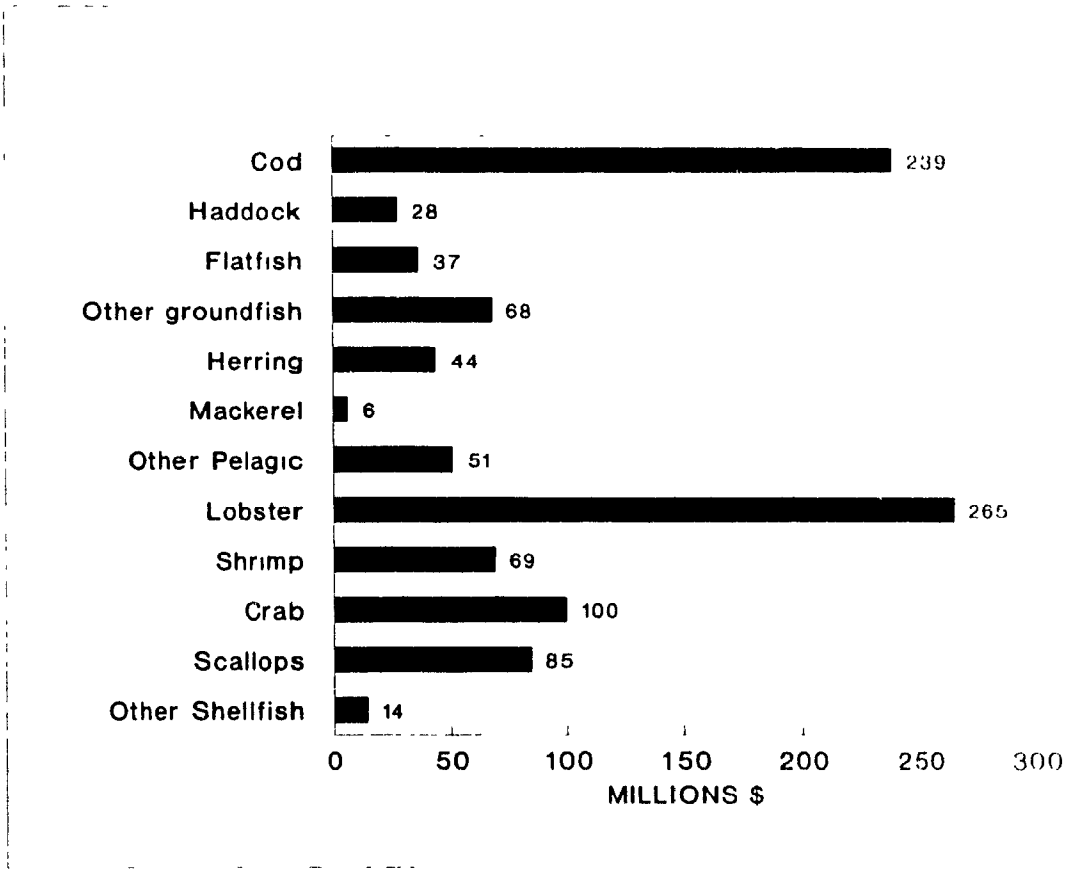

Cod
468
Haddock
31
Flatfish
74
Other Groundfish
161
Herring
276
Mackerel
24
Other Pelagic
102
Scallops
78
Lobster
40
Shrimp
38
Crab
31
Other Shellfish
13
0
100
200
300
400
500
600
000s METRIC TONS

Fig. 2.3 Landed value of the 1988 Atlantic coast Canadian catch by major species.

Source: DFO Statistics, Ottawa


Cod
239
Haddock
28
Flatfish
37
Other groundfish
68
Herring
44
Mackerel
6
Other Pelagic
51
Lobster
265
Shrimp
69
Crab
100
Scallops
85
Other Shellfish
14
0
50
100
150
200
250
300
MILLIONS $

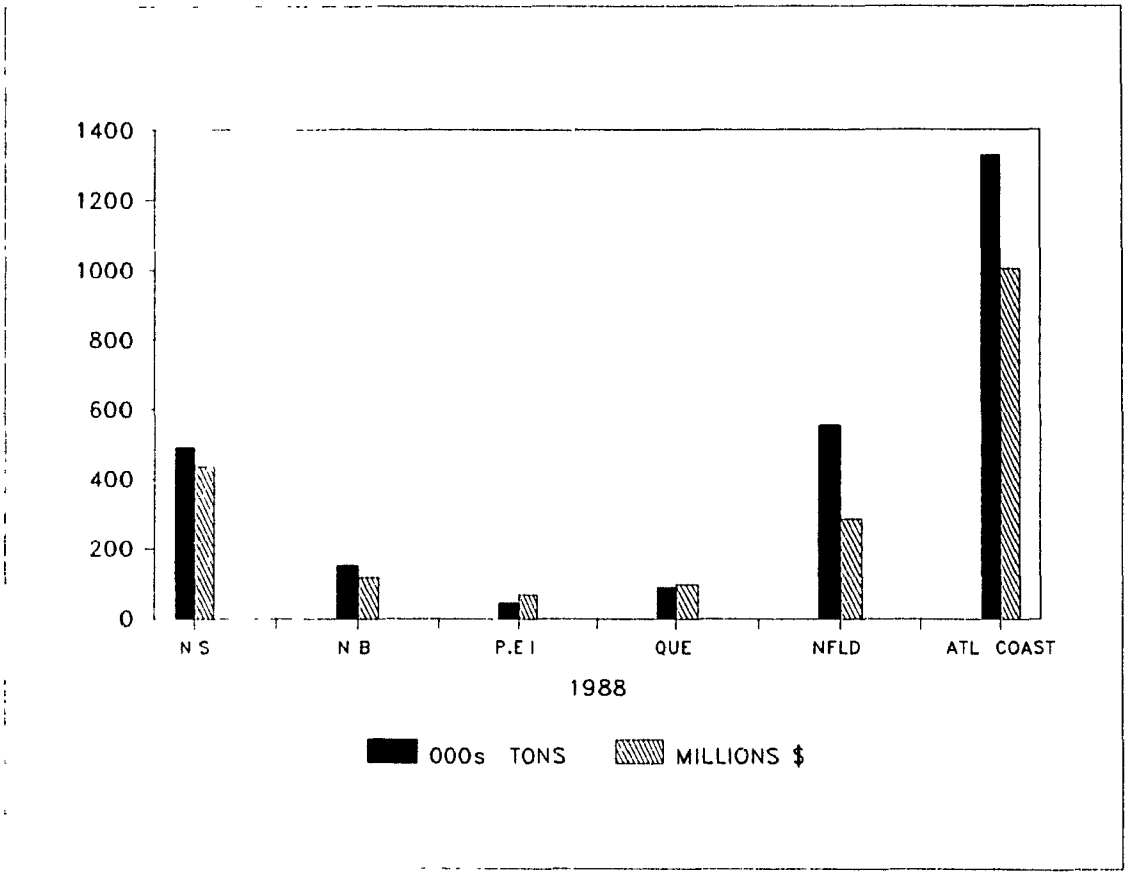
Newfoundland and Nova Scotia together accounted for 78.8% of the Atlantic coast catch and 71.7% of the landed value of that catch in 1988 (Figure 2-4). New Brunswick has consistently ranked third in volume and value but well behind Newfoundland and Nova Scotia. In 1988, New Brunswick accounted for 11.4% of the catch and 11.8% of the landed value. Quebec has consistently ranked fourth and Prince Edward Island fifth in recent years in catch and landed value. Quebec accounted for 6.6% of the catch and 9.9% of the landed value in 1988 and P.F.I. accounted for 3.2% and 6.6% respectively.

Although Newfoundland and Nova Scotia are the most important of the five eastern fishing provinces, there are considerable differences in their fisheries. In recent years (the 1980s) Newfoundland led in volume, accounting for slightly more than 40% of the total Atlantic catch. Nova Scotia, however, has consistently had the largest landed value, accounting for more than 40%. Newfoundland has had the lowest ratio of landed value to volume of all five provinces.

The reason for these differences lies in the different mix of species harvested in each province. Newfoundland is still largely dependent on groundfish; cod is still king there. Nova Scotia harvests a much greater variety of species and, in particular, is blessed with very valuable shellfish fisheries such as lobsters and scallops. The price per pound for these species is much higher than that for groundfish and herring. Given that lobsters are the most valuable species Atlantic - wide and that Nova Scotia's share of the lobster catch in 1988 was 45.8% (53.1% of landed value), it is not surprising that Nova Scotia enjoys the dominant position among the Atlantic provinces in the value of its fisheries.

Fig. 2.4 Provincial distribution of catch and landed value in the Atlantic.

Source: DFO, Statistics, Ottawa


1400
1200
1000
800
600
400
200
0
N S
N B
P.E I
QUE
NFLD
ATL COAST
1988
000s TONS
MILLIONS $

In contrast, Newfoundland accounted for 63.3% of the Atlantic cod catch and 57.0% of the landed value. Cod accounted for 53.5% of the total Newfoundland catch and 47.7% of the value of that catch. In Nova Scotia cod accounted for 26.5% of the catch and only 18.8% of the landed value. Lobsters, on the other hand, accounted for 32.3% of the landed value of the Nova Scotia fishery.

In addition to the greater diversity of species and the greater preponderance of higher - valued species in the Nova Scotia fishery, there are other important differences between the fisheries of the eastern provinces. Much of the Newfoundland coast is ice-bound for a significant portion of the year. Hence, the inshore fisheries for groundfish experience much shorter seasons than those in Nova Scotia. More favourable weather conditions in southwest Nova Scotia and the Bay of Fundy make it more feasible to conduct a year-round fishery with relatively small fishing craft.

The fishing grounds adjacent to southwest Nova Scotia are also suitable for the operation of otter trawlers less than 65 feet in length. Otter trawling by similar-sized vessels has proved not feasible close to the coast off northeast Newfoundland and Labrador. Thus the groundfish fishery in Newfoundland has tended to be more clearly divided into a seasonal inshore fishery by cod-trap, gillnet and longline, and an offshore fishery by large otter trawlers based primarily in ice-free ports on the south coast of Newfoundland.

Nova Scotia has a more diversified groundfish fishery, involving a large midshore fleet (vessels 40 to 65 feet in length) of powerful otter trawlers, or "draggers" as they are often referred to, as well as a fleet of offshore trawlers servicing major ports such as Lunenberg. It also has a specialized scallop dragger fleet and a large fleet of herring purse seiners which harvest the lion's share of the valuable Bay of Fundy herring fishery.

Southern New Brunswick also shares in the valuable Georges Bank scallop fishery and the Bay of Fundy purse seine fishery. The fisheries of Northern New Brunswick are primarily carried out in the Gulf of St. Lawrence which is also ice - infested for much of the year. Vessels from that area conduct fisheries for valuable species such as crabs, lobsters and shrimp, as well as the traditional groundfish fishery. Vessels from four and sometimes five provinces fish side by side on the same fishing grounds.

These interprovincial differences in the composition of the fisheries and dependence on the fisheries are reflected in differences in the numbers of fishermen and numbers and types of fishing vessels among provinces. The number of fishermen in the Atlantic provinces increased from a low (estimated) of 36,000 in 1974 to around 60,000 in the late 1980s (66,000 in 1988). Through the early and mid-1980s the number of fishermen hovered around the 58,000 to 60,000 level. Historically, Newfoundland has had by far the largest number of fishermen, around 45% of the Atlantic total.

Given the relative landed value of the Newfoundland and Nova Scotia fisheries as a percentage of the Atlantic total (28.4% versus 43.3% in 1988) and the relative numbers of fishermen (45.0% versus 24.5%), it is evident that there are many more fishermen in Newfoundland earning lower incomes from fishing. This was borne out by the 1981 survey conducted by the Task Force on Atlantic fisheries. The Task Force found that full-time fishermen earned the highest net incomes in southwest Nova Scotia ($28,766) and the lowest in northeast Newfoundland Labrador ($4,512) (Kirby, 1982). These results have been confirmed by subsequent surveys conducted by the federal Department of Fisheries and Oceans. Overall, incomes earned from fishing are low for a majority of Atlantic fishermen. A significant proportion of the families of fishermen have incomes near or below the poverty line for rural Canada (see Chapter VI, Section 6.2). Higher incomes in

areas such as Southwest Nova Scotia and southern New Brunswick are an exception to the general pattern.

The total number of Atlantic fishing vessels has generally remained stable at around 30,000 since 1980. However, the effective fishing power has increased enormously as larger, more efficient vessels have been built. There have been numerous attempts to constrain this growth in fishing capacity but significant overcapacity exists today in many sectors of the Atlantic fishery (see Chapter VI, Section 3.1 and 3.2).

More than half (56.2%) of the total number of fishing vessels are based in Newfoundland. More than 90% of the Newfoundland fishing vessels are 35 feet or less in length. The effective fishing power of this fleet is constrained by the rather primitive fishing technology which can be employed by such vessels. Yet there are large numbers of fishermen who fish by means of such craft. In some fisheries (e.g. lobsters) relatively small vessels can be used quite effectively to catch the available harvest.

The Atlantic processing sector is widely distributed along the coastline of the four Atlantic provinces and the Gulf of St. Lawrence shoreline of Quebec. In 1988, there were approximately 950 federally registered fish processing establishments in Atlantic Canada.

These establishments vary in size, diversity of operation and type of proprietorship. Processing operations range from small one-or two-person operations curing or trucking-of-fresh-split-fish operations to large modern plants with several hundred employees. Processing activities are diverse, including fresh/frozen production, canning, salting, pickling and marinating. Proprietorship ranges from multinational public and private companies to independent fishermen, to a crown corporation.

While numerous processors contribute to the total output of the industry, three large vertically integrated firms -

Fishery Products International, National Sea Products and Clearwater Seafoods - predominate. They own more than 80% of the offshore trawler fleet which caught about 38% of the total Atlantic groundfish catch in 1988. Also, through their own inshore plants and subsidiaries they account for an additional substantial proportion of the groundfish catch and that of other species. Another significant participant in the processing sector is the Canadian Saltfish Corporation. This corporation is jointly supported by the federal and provincial governments and has the exclusive responsibility for the marketing of saltfish produced in Newfoundland - Labrador and along the north shore of Quebec.

The majority of processing establishments are located in Nova Scotia and Newfoundland (35% and 26% respectively), with 20% in New Brunswick, 11.6% in Quebec, and 6.8% in Prince Edward Island. Despite the large number of processing operations, concentration of production, particularly in the groundfish sector, is high.

Fish processing plants are often divided into two categories - year-round and seasonal. The year-round plants are owned primarily by the large vertically-integrated firms. The seasonal plants tend to be operated by small independent companies. There is, however, overlap between the two major groupings.

The operating period for seasonal plants varies depending on area, resource availability and product diversification. Plants producing a single product such as canned or frozen shellfish or cured herring are greatly dependent on resource availability and, as a consequence, often operate only for a few months. The ability of a plant to diversify into other products may extend its operating season to 6 or 8 months.

Fish processing capacity has increased considerably since 1977. Accurate measures of the extent of capacity growth are not available. However, the increase in the number of fish processing establishments provides a rough indicator of what

has occurred. The total number of fish processing establishments increased from 519 in 1977 to 953 in 1988, an increase of 84% (Figure 2-5). Studies prior to 1977 indicated that there was already overcapacity in the processing sector. The growth since 1977 has added to that overcapacity. Today there is significant excess processing capacity in most areas of the Atlantic fisheries (see Chapter VI, Section 5).

The U.S. is Canada's primary export market, taking about 56% of Canada's exports nationally in 1988. However, on a regional basis, the U.S. is a much more important market for the Atlantic fisheries than for the Pacific. In 1988, 64% of Atlantic Canada's fish exports worth $1.175 billion went to the U.S. market (Figure 2-6). The EC was second with 16% valued at $275 million. Japan was third with 14% valued at $252 million. Other countries accounted for the remaining 7%, valued at $137 million. The U.S. market was particularly important for Atlantic Canada's groundfish exports.

3.2 The Pacific Fisheries

Overall, the Pacific fisheries account for about 15% of Canada's commercial fisheries landings, about 30% of the landed value and about 30% of the value of fishery products. Pacific salmon (five species) accounted for 33% of the catch in volume in 1988 at 87,000t (Figure 2-7). Herring accounted for 12% of the catch and shellfish only 9%. Groundfish species as a group constituted 44.0% of the catch.

The relative contribution of these species to the value differs significantly from their relative contribution to the catch. Salmon were king in terms of landed value, contributing 60% (Figure 2-8). Herring was second at 15.6%. Groundfish species were third at 15.5%. Shellfish were fourth at 8% of the landed value.

Fig. 2.5 Numbers of registered fish processing establishments in Atlantic Canada - 1977-1988.
Source: DFO Fish Inspection Branch, Ottawa

NOTE: Number of establishments in New Brunswick in 1982 is not available

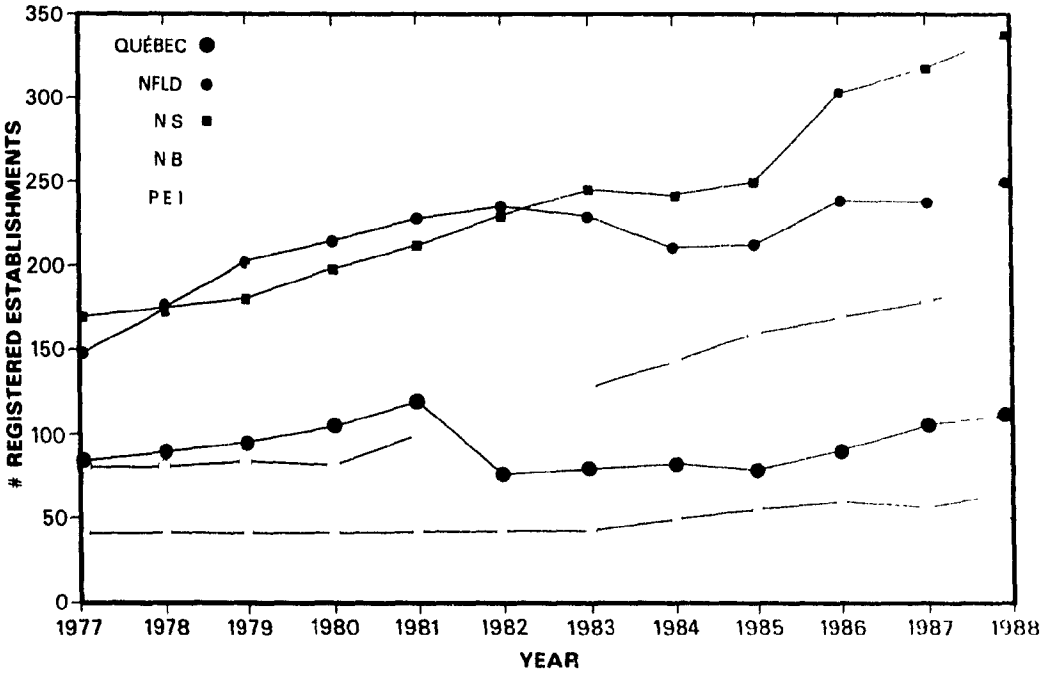

350
300
250
200
150
100
50
0
QUÉBEC
NFLD
N S
N B
P E I
REGISTERED ESTABLISHMENTS
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
YEAR

Fig. 2.6 Value of Canadian fish exports to various countries in 1988 in millions of dollars.

Source: DFO Marketing Statistics, Ottawa

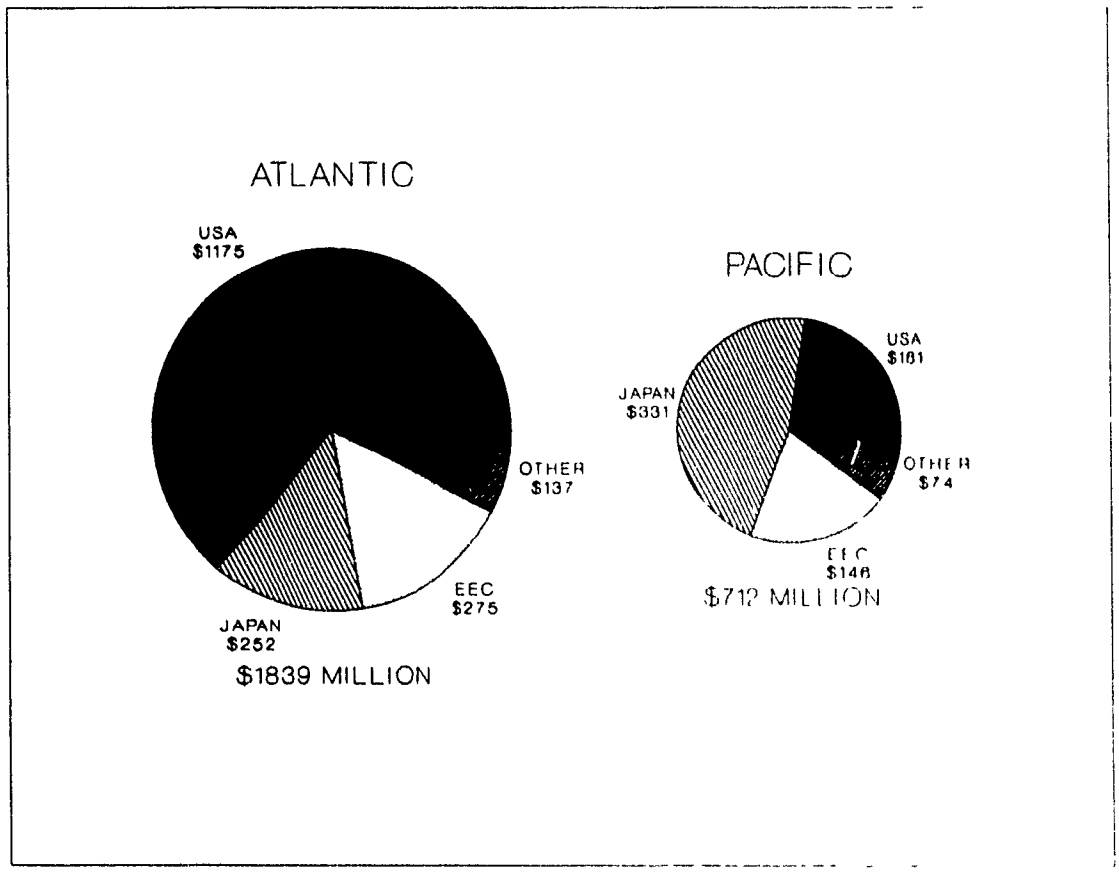

ATLANTIC
USA
$1175
OTHER
$137
EEC
$275
JAPAN
$252
$1839 MILLION
PACIFIC
USA
$181
JAPAN
$331
OTHER
$74
EEC
$146
$712 MILLION

Fig. 2.7 Volume of the 1988 British Columbia catch by major species.

Source: DFO Statistics, Ottawa

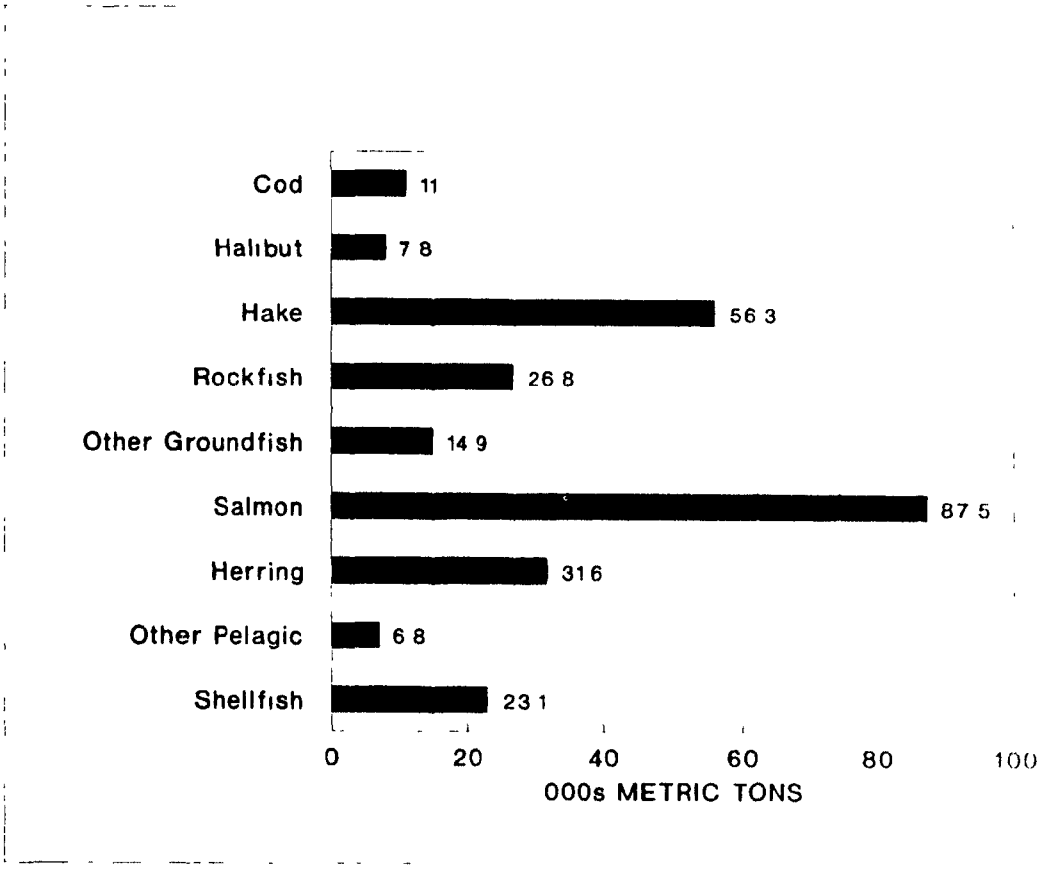
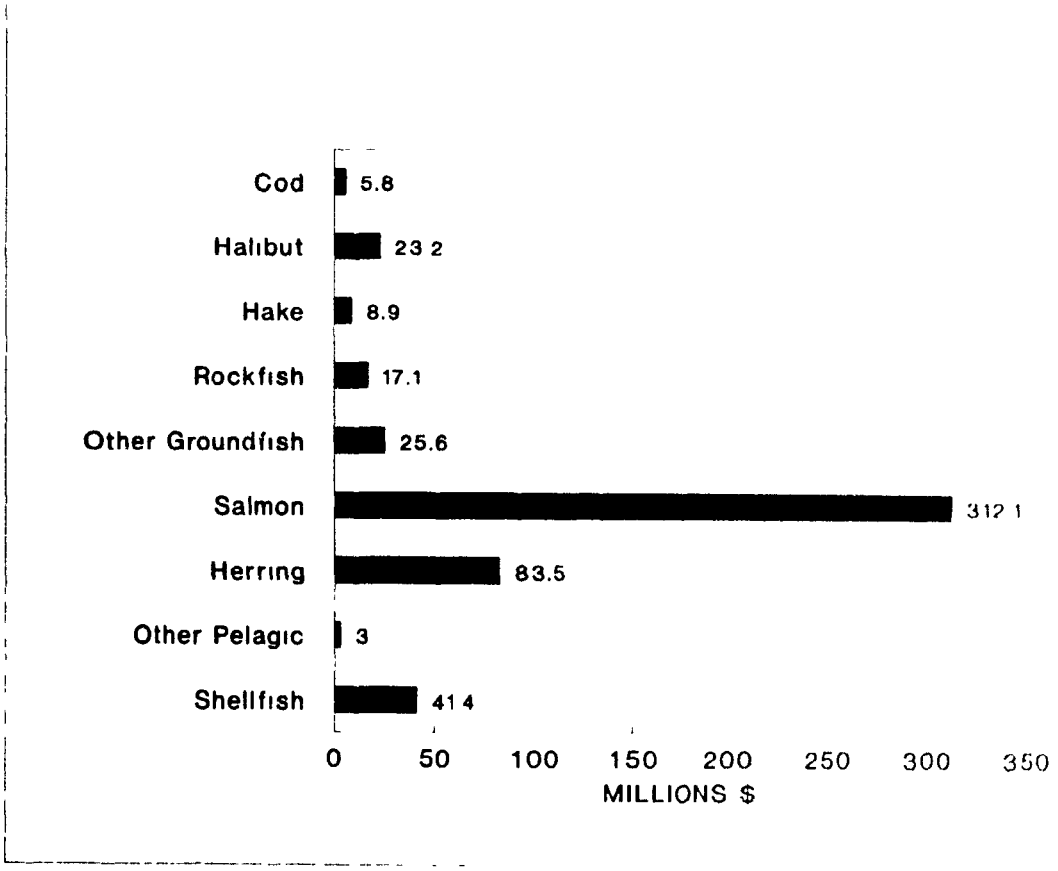

Cod
11
Halibut
7 8
Hake
56 3
Rockfish
26 8
Other Groundfish
14 9
Salmon
87 5
Herring
31 6
Other Pelagic
6 8
Shellfish
23 1
0
20
40
60
80
100
000s METRIC TONS

Fig. 2.8 Landed value of the 1988 British Columbia catch by major species.

Source: DFO Statistics, Ottawa


Cod
5.8
Halibut
23 2
Hake
8.9
Rockfish
17.1
Other Groundfish
25.6
Salmon
312 1
Herring
83.5
Other Pelagic
3
Shellfish
41 4
0
50
100
150
200
250
300
350
MILLIONS $

The groundfish contribution to total landed value fluctuated in the 10-20% range through the 1970s and 1980s. The species composition of the catch has changed significantly in recent years. The groundfish fishery can generally be divided into three components: (1) the groundfish trawl fishery that harvests species such as rockfish, Pacific cod, hake, sole and a variety of other bottom fish; (2) the Pacific halibut fishery; and (3) the sablefish (black cod) fishery. In relative order of economic importance the principal groundfish species exclusive of halibut are rockfish, Pacific hake, Pacific cod, sole and a variety of other species.

During 1986 to 1989 there were approximately 20,000 registered fishermen in British Columbia. This is the highest number since the 1950s and double the low point in 1972 when the number of fishermen was 9,900. This total represents the number of personal fishing licences issued to commercial fishermen. It has been estimated that only 15,000 of these could be considered to be "active" fishermen. (Fisheries Council of British Columbia, 1989; Price Waterhouse, 1990). About 10,000 fishermen, two-thirds of the number of active fishermen, are involved in the salmon fisheries.

In 1988, there were 226 fish processing plants operating in British Columbia. Thirteen were engaged in canning, 117 were cold storage plants and 96 were involved in packing and other types of processing. Ninety four of these plants were located on Vancouver Island, 113 on the Lower Mainland and 19 on the Central and North coasts. In terms of the total value of finished goods, the plants on the Lower Mainland generated 70% of the value, those on Vancouver Island 10% and those on the Central and North Coast 20% (Price Waterhouse, 1990). Processing activities are less dispersed in British Columbia than in the Atlantic provinces.

Monthly average employment in the fish processing sector was reported to be around 5,000 during 1987-89. Because of the seasonal nature of the industry, peak employment is

considerably higher, around 8,000 - 11,000 during 1986-89. The direct person-years of employment in the fish processing sector were estimated to be around 5,600-5,700 in 1988 and 1989 (Price Waterhouse, 1990).

3.3 The Arctic Fisheries

There are different ways of defining the Canadian Arctic. The Arctic Waters Pollution Prevention Act (R.S.C. 1985 Chap. A12 as amended) defines Arctic waters as the waters adjacent to the mainland and islands of the Canadian Arctic "within the area enclosed by the sixtieth parallel of north latitude, the one hundred and forty-first meridian of longitude and a line measured seaward from the nearest Canadian land a distance of one hundred nautical miles" and in the area between the islands of the Canadian Arctic and Greenland the line of equidistance.

Dunbar (McGill University, Montréal, Personal Communication) has pointed out that the 60° North latitude boundary is rather meaningless in marine terms. The West Greenland Current, for instance, is definitely subarctic and most of the Labrador Sea is Atlantic.

Here I use the term Canadian Arctic to include the open waters of the Arctic Ocean, the Beaufort Sea, Hudson Bay, Hudson Strait, Ungava Bay, the channels of the Arctic Archipelago. and Baffin Bay. The resources in Davis Strait are managed as part of the Atlantic fisheries management regime and are considered here to be Atlantic fisheries. This corresponds reasonably well to the approach taken for practical purposes by Bedford Institute oceanographers to the definition of Arctic oceanography studies (Dr. Jim Elliot, DFO, Dartmouth, Personal Communication).

Although not substantial in quantity or landed value, fish and marine mammal resources contribute significantly to the livelihood and way of life of Canada's native peoples in the Arctic. The Arctic coastal area is populated primarily by

aboriginal people, particularly Inuit. About 40,000 people, 78% aboriginal, occupy 60 communities along the Arctic coast and in the MacKenzie Delta (Clarke, In Press).

The native peoples in the Arctic have harvested fish and marine mammals for thousands of years. Subsistence fisheries provide a major source of food and a major contribution to the cultural life of these residents. As Clarke (In Press) notes, the commercial and recreational fisheries and the commercial use of marine mammal products contribute one of the few sources of employment and cash to the economies of the communities and the area.

The species exploited are primarily anadromous fish and marine mammals. The anadromous fish migrate to estuaries, rivers and lakes and away from the Arctic seas in winter. Most marine mammals also migrate to areas where water and ice conditions are more favourable, e.g. southern Davis Strait and the Bering Sea.

The anadromous fishery harvests primarily Arctic charr and other species such as whitefish, cisco, inconnu and Atlantic salmon. Although the amount of the subsistence harvest is not very well known, it is thought to constitute the major portion of the total catch of anadromous fish. There is also a small commercial fishery for Arctic charr and some other anadromous species. This involves about 500 fishermen.

Several species of marine mammals occur in the Arctic - beluga, narwhal, bowhead, walrus, ringed seal, harp seal, and hooded, bearded and harbour seals in the eastern Arctic and Hudson Bay, and beluga, bowhead and the ringed and bearded seals in the western Arctic. About 6,000 natives participate in the subsistence harvest for marine mammals. The subsistence harvest of beluga, narwhal and walrus numbers in the hundreds. The harvest of seals numbers in the low thousands since the collapse of the harp seal market following

the European ban on the import of "whitecoat" pelts in the early 1980s.

Clarke (In Press) concluded that the Arctic fisheries provided significant benefits to the residents and the economy. He estimated the rough dollar value of benefits as $15 million for the replacement value of food consumed from the subsistence harvest, $2 million as other consumer surplus benefits and $7 million as the value added to the Canadian economy. The most important contribution is the support that the Arctic fisheries provide to the aboriginal cultures, food and other materials for their use, and employment for 50-75% of the population.

4. CONCLUSION

Canada's abundant fisheries resources and marine and freshwater habitats support fisheries in the many lakes and rivers scattered across the vast Canadian land mass, in coastal regions, and on the continental shelf within and outside Canada's 200-mile fisheries zone. These fisheries are diverse and dependent upon a renewable but variable resource base.

The two major marine fisheries in Canada are based on the Atlantic and Pacific coasts. Although the Arctic coastline is long, the Arctic supports primarily subsistence fisheries for Canada's native peoples. Inland the commercial fishery is small and overshadowed by the important recreational fisheries.

Canada's marine commercial fisheries on the Atlantic coast occur primarily in economically impoverished regions where there are few alternative employment opportunities. More than a thousand Atlantic coastal communities depend on the fisheries for employment and income. On the Pacific coast the degree of regional dependence on the fisheries is less than on the Atlantic but nonetheless the fisheries are an important component of the British Columbia economy.

In national economic terms Canada's commercial fisheries appear insignificant. Regionally they are the lifeblood of more than a thousand communities and thousands of fishermen, plant workers and their dependents who depend on the fisheries to put bread on the table. Some fishermen earn good incomes from fishing; others eke out a meagre existence. But fishing is much more than a source of income. It is a way of life. This, too, is part of the diversity.

5. PROSPECTUS

Despite the bountiful natural resources and the importance of the marine commercial fisheries to the economy and the social fabric of the coastal regions, Canada's marine fisheries have been plagued by recurrent crises. In the chapters that follow I will show that, throughout the history of Canada's commercial fisheries, there runs an underlying pattern of feast and famine, a pattern of boom and bust with the history of the fisheries being a roller coaster ride between valleys of poverty and peaks of prosperity.

These problems will be shown to be rooted in the inherent natural variability of the fisheries resources, the common property nature of these resources, compounded by the very large reliance on export markets, and the buffeting produced by the vagaries of market fluctuations. It will be shown that the common property nature of the resource leads to an inexorable race for the fish. This has been described as the Tragedy of the Commons (Pearse, 1982; Hardin, 1968). In an unregulated fishery each fisherman races to obtain the largest share of the catch for himself. Since the sustainable harvest is limited, this destructive competition draws more labour and capital into the fisheries than they can sustain. Potential economic benefits are dissipated.

The diverse fisheries resources are harvested by many competing user groups. The common property nature of the resource results in conflict, sometimes small-scale, sometimes

large-scale, among these user groups. Reconciling this conflict poses major challenges for fisheries managers.

Under the Canadian Constitution, the federal government has responsibility for "the seacoast and inland fisheries". In reality, jurisdiction is divided because the provinces have jurisdiction over onshore processing, the federal government over the resource, harvesting, and interprovincial and external exporting of fish. The primary federal role is exercised through the federal Minister of Fisheries and Oceans and the Department of Fisheries and Oceans. For a long time a bit player in the Ottawa bureaucracy, the Department of Fisheries and Oceans (and its predecessors) has always been one of the most visible arms of the federal government in the coastal regions.

Prior to extension of fisheries jurisdiction to 200 miles in 1977, the federal Department of Fisheries (in its various incarnations) attempted to manage the coastal fisheries. It was hampered, particularly on the Atlantic coast, by the migratory nature of the fish stocks, with the same fish stock being fished in coastal bays by Canadian fishermen and on the continental shelf by Canadian and foreign fishermen. In the mid-1970s, in the context of a developing consensus at the United Nations Third Law of the Sea Conference, there was a worldwide move by many countries to extend national fisheries jurisdiction to 200 miles. This, in effect, represented enclosure of what had been an international common property resource. The chapters that follow examine the events leading to the 200-mile limit, Canada's attempts to rebuild overfished fish stocks and achieve greater stability in its marine fisheries, and why these attempts have been only partially successful.

CHAPTER III

GENESIS OF THE CANADIAN 200-MILE FISHERIES ZONE

1. INTRODUCTION

The general acceptance by many countries in the mid 1970s of the concept of a 200-mile exclusive economic zone represented a dramatic departure from the concept of a narrow territorial sea which had prevailed for centuries. The development of a consensus on the 200-mile zone in the Third United Nations Law of the Sea Conference (UNCLOS III) was the culmination of efforts over several decades to secure recognition of the rights of coastal states to exercise increased jurisdiction over resources adjacent to their coasts. Canada played a key role in the discussions leading to this consensus at UNCLOS III. In this chapter I describe the factors and events leading up to Canada's decision to extend its jurisdiction to 200 miles.

For several centuries it was generally accepted that the high seas were free to all. The doctrine of freedom of the high seas has come to be associated with the publication in 1609 by Hugo Grotius, a Dutch jurist, of a work entitled Liberum. Grotius, in his work, developed the argument for a principle of freedom of the high seas, arguing that some things, such as food, must be "exhausted" to be utilized and ownership was necessary to use such things. Other things, such as air and running water, were not exhausted by use and should remain free for the use of all. The sea fell into the second category. Grotius argued no person or nation could appropriate any part of the high seas for exclusive use.

This brought the Dutch into conflict with the British, who, while acknowledging a freedom of navigation, reserved the

nearshore fisheries area for their own use. John Selden, in a publication entitled Mare Clausum: of the Dominion or ownership of the Sea (1635) contended that the resources of the sea were just as exhaustible as land resources. He argued for the right to restrict foreign fishing off British shores. This led to the concept of a territorial sea as well as to the principle of reserving areas close to the coast for limited or general purposes. Another Dutch jurist, Cornelius Van Bynkershoek (1702), subsequently took the view that the dominion of the coastal state over the sea extended to the point at which the coastal state's power effectively ended. This became interpreted as the distance within three nautical miles (Hollick, 1981).

Thus evolved the concept of a territorial sea and the high seas. The doctrine of freedom of the high seas was reflected in the Treaty of Paris of 1856.

2. THE 1930 HAGUE CONFERENCE

The conflict between the concepts of coastal state rights over some portion of the seas and the freedom of the high seas continued into and intensified in the 20th century. The Hague Conference for the Codification of International Law in 1930 considered the matter of the territorial sea and a contiguous zone. At that time the U.S. and Britain claimed a three-mile territorial sea, the Scandinavian countries claimed four miles, and Russia under the Czars had laid claim to a 12-mile territorial sea. It was agreed that the territorial sea formed part of the territory of coastal states and that the high seas were free to all. The Conference, however, failed to agree on the width of the territorial sea and on the nature and breadth of any contiguous zone. A three-mile limit for the territorial sea was supported by Britain and the Commonwealth countries, including Canada. Others argued for limited jurisdiction beyond three miles. Britain, with the support of the Commonwealth countries, blocked any attempt to

recognize any form of jurisdiction beyond the territorial sea. Nonetheless, this debate planted the seeds for the later concept of a separate fishing zone (Hollick, 1981).

Following the Second World War Grotius' approach began to be questioned. His assumptions proved invalid. During the next two decades it became apparent that the resources of the oceans were far from inexhaustible. Advances in technology made it possible to deplete fish stocks through overfishing. Mineral and petroleum resources were discovered on the continental shelf and the deep seabed and techniques for their extraction developed. Pollution by passing merchant vessels became a significant concern.

3. THE TRUMAN PROCLAMATION - 1945

These developments led to unilateral action by several countries in the 1945-1958 period. To the later chagrin of the United States, these actions had their origin in the Truman Proclamations of 1945. There were two proclamations, both issued on September 28, 1945 (Truman, 1945a and b). One, the continental shelf proclamation, stated:

> "The Government of the United States regards the natural resources of the subsoil and seabed of the continental shelf beneath the high seas but contiguous to the coasts of the United States as appertaining to the United States, subject to its jurisdiction and control." (Truman, 1945a)
>
> The second proclamation, concerning fisheries, stated that:
>
> "The United States regards it as proper to establish conservation zones in those areas of the high seas contiguous to the coasts of the United States wherein fishing activities have been or in the future may be developed and maintained on a substantial scale." (Truman, 1945b)

The evolution of these policies in the last days of the Roosevelt administration is described in Watt (1979) and Hollick (1981).

4. UNILATERAL ACTIONS BY LATIN AMERICAN STATES

The Truman Proclamations were clearly expansionist in nature and provoked a series of unilateral claims by a number of Latin American states. Mexico was the first to take action following the U.S. proclamations. On October 29, 1945, the President of Mexico made a similar declaration, claiming as national territory the continental shelf adjacent to Mexico to a depth of 200 meters, and its resources. On December 6, 1945, an amendment to the Mexican Constitution laid claim to the waters covering the continental shelf as the property of the nation. This, however, was never promulgated by the Executive (Mexico, 1945). In 1946, Panama and Argentina made somewhat similar proclamations.

Chile, on June 23, 1947, was the first to assert jurisdiction over a 200-mile zone. The origins of this claim have been described by Hollick (1977). On August 1, 1947, Peru also proclaimed a 200-mile zone. Peru's claim centered on protecting the abundant fisheries off its coasts from both neighbouring countries and distant water states (Peru, 1947).

All of these claims cited the Truman Proclamations as precedent. By 1950 U.S. officials realized that the Truman Proclamations had led to a substantial assault on the long standing principles of the freedom of the high seas and the three-mile territorial sea (Watt, 1979).

The U.S. temporarily stemmed the flood of new claims by strong protests to Argentina, Chile and Peru in mid-1948. But in the early 1950s further claims were made. Six Latin American countries issued new or modified claims in 1950.

Opposed by the U.S., Chile, Ecuador and Peru took action to coordinate their claims. This led to the Santiago Declaration of August, 1952, in which the CEP countries

asserted sole sovereignty and jurisdiction over a zone including the sea floor to a distance of 200 miles from the coasts or from islands (Anon, 1952).

5. CANADA'S POSITION - 1945-1958

The waters of the Northwest Atlantic had been fished by Europeans for centuries. In Canada, following the Second World War and the Bates Report (Bates, 1944), emphasis was placed on developing the Canadian offshore fishery. Meanwhile, foreign fishing activities off the Atlantic and Pacific coasts began to increase in the post-war period.

Britain had undertaken several initiatives to address the overfishing problem in the Northeast Atlantic but aimed at encompassing the entire North Atlantic. A Convention on the Regulation of Meshes of Fishing Nets and Size Limits of Fish was adopted in London in 1937 and signed by ten west European countries but never came into effect. Britain tried again in 1943 and 1946. At the 1943 meeting there were differences over the size of the proposed convention area. While Canada supported a North Atlantic convention, the U.S. wanted separate treatment of the fisheries of the Western and Eastern Atlantic, with a division at approximately 40° west longitude (Hollick, 1981).

Britain backed off and between 1943 and 1946 persuaded Canada to consider separate conventions for the two areas. In April 1946, another Convention for the Regulation of the Meshes of Fishing Nets and Size Limits was adopted, applying to the Northeast Atlantic and Arctic (Cushing, 1971-72).

Concerned about the possible shift of fishing effort to waters off their coasts, Canada and Newfoundland considered issuing proclamations similar to the Truman Proclamations. This was discouraged by Britain. Meanwhile, the U.S. launched an initiative to establish a multilateral conservation regime for the Northwest Atlantic. The U.S. invited Canada, Denmark,

France, Great Britain, Iceland, Newfoundland, Norway, Portugal and Spain to a meeting in Washington in January 1949 to discuss a draft convention.

Canada expressed reservations about the scope of the proposed commission, preferring to limit its powers to investigation and recommendations. Also the U.S. draft had adopted Newfoundland's narrow territorial waters, which led to fears in Canada that it would be difficult to extend these waters outward later (Hollick, 1981).

Canada was persuaded by U.S. officials to participate with the understanding that the commission's powers would be limited to investigation. The Conference reached agreement on a Northwest Atlantic Fisheries Convention, which entered into force on July 3, 1950. That Convention provided for an International Commission for the Northwest Atlantic Fisheries (ICNAF), which met for the first time in 1951. ICNAF had ten members by 1953 and other countries joined over the next two decades.

The Northwest Atlantic Fisheries Convention recognized the traditional distinction between the territorial sea and the high seas with the authority of ICNAF extending only to the high seas beyond the jurisdiction of coastal states. Canada entered a reservation to the Convention as follows: "Any claims Canada may have in regards to the limits of territorial waters and to jurisdiction over fisheries particularly as a result of the entry of Newfoundland into Confederation will not be prejudiced" (UN, 1953).

One of the conditions attached to the entry of Newfoundland into Confederation was that the Canadian government agree to apply the headland-to-headland rule for the measurement of the territorial waters along the coasts of the new province. Prime Minister Louis St. Laurent stated in the House of Commons on February 8, 1949:

> "We intend to contend and hope to be able to get acquiescence in the contention that the waters west of

Newfoundland constituting the Gulf of St. Lawrence shall become an inland sea," i.e. part of the territorial waters of Canada (Canada, 1949).

No action was taken on this matter until the 1960s. Meanwhile, pressure was growing in Canada for Canada to abandon its traditional adherence to the three-mile territorial sea. This was exacerbated by the fact that Canadian trawlers on the east coast had been prohibited since 1911 from fishing within twelve nautical miles of certain portions of the coast (except Newfoundland) while foreign trawlers could fish in the zone between three and twelve miles from the coast.

On the Pacific coast, bilateral management of the Pacific halibut fishery took place through the International Pacific Halibut Commission, first negotiated in 1923. Canada's international interests were largely concerned with reducing the interception of Canadian salmon by Japan and the United States. There was bilateral management of Fraser River sockeye salmon through the International Pacific Salmon Commission, established by the Canada-U.S. Sockeye Salmon Fisheries Convention, ratified in 1937. Multilateral management of Pacific salmon was undertaken through the International North Pacific Fisheries Commission (INPFC), involving the U.S., Japan and Canada. The Truman Proclamation of 1945 respecting fisheries had, to a large extent, been motivated by the threat posed by Japan to the Alaskan salmon fisheries in the pre-war years (Hollick, 1981). The U.S., Japan and Canada agreed in Tokyo after World War II to the International Convention for the High Seas Fisheries of the North Pacific Ocean. That convention introduced the principle of abstention, whereby any of the contracting parties might be requested to abstain from participating in a fully utilized fishery, if such fishery had been subjected to an extensive conservation program by one or both of the other parties. This applied to Japan, which agreed to abstain from fishing.

Canada and the U.S. agreed to carry out necessary conservation measures with respect to the halibut, herring and salmon stocks in specified parts of the convention area off their respective coasts. During a renegotiation of the Convention in 1951, Japan agreed to refrain from fishing Pacific Salmon east of 175°W longitude, the abstention line. This provided substantial protection for Canadian salmon stocks from Japanese fishing (Bell, 1981).

Despite these measures, in 1952 the United Fishermen, and Allied Worker's Union proposed in a submission to the Minister of Fisheries that Canada adopt a nine-mile territorial sea to provide fisheries protection (UFAWU, 1952). (Subsequently this union advocated the adoption of a twelve-mile territorial sea). The Minister of Fisheries, James Sinclair, reacted by appointing a committee, headed by the Dean of the Faculty of Law of the University of British Columbia, to review the situation and make recommendations.

On July 30, 1956, the Prime Minister stated in the House of Commons that "we think the twelve-mile limit should be recognized", with due recognition of historic fishing rights. On August 13, 1956, Minister Sinclair indicated that Canada favoured a twelve-mile territorial zone (Canada, 1956a and b).

The First United Nations Conference on the Law of the Sea, UNCLOS I, was held in 1958. This was followed by a Second Conference, UNCLOS II, in 1960. More than a decade later the Third UN Conference on the Law of the Sea, UNCLOS III, which extended over a decade from 1973 to 1982, produced a new Law of the Sea.

6. UNCLOS I

At UNCLOS I, in March 1958, Canada proposed a three-mile territorial sea and a nine-mile contiguous zone, with the proviso that in the contiguous zone a coastal state would have "the same rights in respect of fishing and the exploitation of

the living resources of the sea in this zone as it has in its territorial sea" (Canada, 1958a).

The Chairman of the Canadian delegation explained that, while Canada was sympathetic to the Latin American push for wider fishery jurisdiction, Canada thought it unlikely that there could be agreement on anything more than a twelve-mile contiguous zone. The proposed fishing zone was intended to reserve "a reasonable coastal belt for the use of fishermen of the coastal states... many of (whose) communities may largely depend for their livelihood on the preservation of the fishing stock in the nearby seas" (Canada, 1959).

The Canadian proposal, while reflecting the desire of coastal states to secure jurisdiction over the fisheries resources adjacent to their coasts, was nonetheless tied to the concept of a narrow three-mile territorial sea. As such, it was an attempt to reconcile the views of those who wished greater control of fisheries adjacent to their coasts and those who opposed any extension of the territorial sea because of interference with the concept of the freedom of the high seas. However, Britain and the United States changed their position to propose a six-mile territorial sea and a six-mile fishing zone beyond the territorial sea. The hook was that traditional fishing rights would be recognized in the outer six miles. This prompted Canada to shift ground. It allied itself with India and Mexico to co-sponsor a proposal for a six-mile territorial sea and a six-mile exclusive fishing zone, with the rider that territorial seas between six and twelve miles claimed prior to UNCLOS I would also be acceptable. This was later dropped and a Canadian proposal for a six-mile territorial sea plus a six-mile fishing zone was voted on, along with three other major proposals, in Plenary. There was insufficient support for passage of either of the proposals (Gotlieb, 1964).

UNCLOS I did produce concrete results in the form of four Conventions:

1. The Territorial Sea and Contiguous Zone (which did not specify an outer limit);
2. The High Seas;
3. The Continental Shelf; and
4. Fishing and Conservation of the Living Resources of the High Seas.

The first two Conventions merely confirmed the existing law of the sea with some minor modifications. The Continental Shelf Convention, which confirmed the thrust toward coastal state rights over exploration and exploitation of the natural seabed and resources of the continental shelf, contained a provision concerning the sedentary living resources of the seabed. It defined the limits of the continental shelf as a depth of 200 meters or a greater depth where exploitation is possible. The High Seas Fishing Convention was never ratified by most nations actively involved in high seas fishing.

Despite the failure of UNCLOS I to define the territorial sea and contiguous zone, Canadian politicians and officials described the outcome of the Conference in positive terms (Canada 1958b; Ozere, 1973).

7. UNCLOS II

In 1960, another Law of the Sea Conference was convened in an attempt to resolve the dispute about the width of the territorial sea and the nature of a contiguous fishing zone. Canada again proposed a six-mile territorial sea and a six-mile contiguous fishing zone. The United States modified its earlier proposal. This incorporated the previous provision that states which had fished regularly in the contiguous six-mile zone during the preceding five years could continue to do so in future. As modified, fishing rights would be limited to the species, quantities and areas fished during the preceding five-year period. Canada and the U.S. then co-sponsored a compromise proposal which provided for a six-mile territorial sea, a six-mile fishing zone outside this and a ten-year

phasing-out period for those countries which had fished in the outer six miles during the preceding five years. While there were other proposals, e.g. for a twelve-mile territorial sea, the Canada-U.S. joint proposal garnered the most favour, with 54 votes in favour, 28 against and 5 abstentions. It was not adopted because it fell one vote short of the necessary two-thirds majority (Gotlieb, 1964).

8. CANADIAN ACTIONS - 1963-1964

With the failure of these multilateral efforts, Canada embraced a cautious unilateral approach during the 1960s. There was a rapid development in state practice during the period 1958 to 1964. A number of additional countries claimed a territorial sea of twelve miles. Another group of states established fishing limits beyond the limits of their territorial sea. As another instance of application of the concepts discussed at UNCLOS II, Britain agreed with Iceland, Norway and Denmark during 1959-61 on various forms of phase-out agreements (Gotlieb, 1964).

On January 28, 1963, the Fisheries Council of Canada (FCC), submitted a Brief to the Government of Canada (FCC, 1963). The FCC urged the government to declare certain bodies of water as Canadian national waters, and adopt the straight baseline principle, from which the breadth of territorial seas and the exclusive fishing zone would be measured.

On June 4, 1963, Canada announced its intention to take unilateral action . The Prime Minister stated: "The Canadian government has decided to establish a 12-mile exclusive fisheries zone along the whole of Canada's coastline as of mid-May 1964, and to implement the straight baseline system at the same time as the basis from which Canada's territorial sea and exclusive fisheries zone shall be measured" (Canada, 1963).

A new Territorial Sea and Fishing Zone Act was passed in 1964. It created a nine-mile fishing zone beyond the three-

mile territorial sea and provided enabling legislation for the closure of other areas to fishing through the use of straight baselines (Canada, 1964). The use of headland-to-headland baselines provided the opportunity to significantly extend Canada's internal waters. However, in terms of the breadth of the territorial sea, the 1964 Act represented a step backward from the "six plus six" formula which Canada had pursued at the 1960 LOS Conference.

The potential impact of the 1964 Act was negated by the passage of an Order in Council which allowed the fishing vessels of the United States to continue to fish in the contiguous zones on both the Atlantic and Pacific coasts, and the fishing vessels of Britain, Denmark, France, Italy, Norway, Portugal and Spain to fish on the east coast, pending the negotiation of agreements with these countries. It was recognized that vessels of France and the U.S. would be allowed to continue fishing in the areas, subject to appropriate conservation regulations, but it was intended that fishing by the other countries would be phased out once specific arrangements had been negotiated.

Gotlieb (1964) described the adoption of the 1964 Act as "a decision of historic importance in the evolution of Canadian policy with respect to its adjacent waters." He was optimistic about a speedy implementation. This optimism was premature. Negotiations with the various countries did not proceed smoothly and agreements were not reached until Canada took further unilateral action in 1970. Not until October 1967 was the first list of geographical co-ordinates of points for the establishment of straight baselines issued by the Governor in Council. That list established straight baselines only along the coast of Labrador and the eastern and southern coasts of Newfoundland. In 1969, a second list of geographical co-ordinates was published establishing straight baselines along the eastern and southern coasts of Nova Scotia

and the western coasts of Vancouver Island and the Queen Charlotte Islands (Legault, 1974).

Despite these delays, Legault (1974) described the 1964 Act as a "turning point in the evolution of Canada's maritime policy and maritime claims." Until the 1958 and 1960 Conferences on the Law of the Sea, Canada had followed "a path of negotiation, arbitration and bilateral and multilat · ·l agreement." While Canada did not abandon that path in the 1960s and 1970s, the 1964 Act added unilateral action as one of the tools of Canadian maritime policy.

Meanwhile, fisheries developments during the 1950s and 1960s helped to shape Canada's actions as a coastal state in the 1970s.

9. FISHERIES DEVELOPMENTS IN THE NORTHWEST ATLANTIC - 1945-1970

When ICNAF was established (1949-1951), there was no pressing conservation concern off the Canadian Atlantic coast. A number of west European countries had fished there for centuries. Efforts were underway in Canada to develop an offshore Atlantic groundfish fishery by Canadian trawlers. The offshore trawler fleet grew to about 160 vessels, owned by a few major companies. Federal and provincial governments collaborated to promote post-war fisheries development, through exploratory fishing, vessel-building subsidies and grants for the construction of new processing plants.

Prior to 1947 the Northwest Atlantic fisheries were relatively stable. France, Spain and Portugal had been fishing in the area for centuries. Newfoundland, Canada and the U.S. began to develop offshore fisheries. The European fisheries were concentrated on the Grand Banks.

Cod was the primary species fished both by Europeans and Canadians. In Newfoundland "fish" meant "cod." Canadian and U.S. fishermen were, however, beginning to land other groundfish species such as haddock and pollock, and pelagic

species such as herring and mackerel. Canadians began to fish redfish in the early 1950s.

Total landings taken annually off the Canadian Atlantic coast during this period have been estimated to be in the order of 500,000-600,000 tons (Regier and McCracken, 1975).

During the next decade (1947-1957) there was an orderly expansion of the fisheries in the Northwest Atlantic. There was no major change in the countries fishing off the Canadian Atlantic coast, with the exception of minor fisheries by Britain and Norway. European fishermen fished more in the Gulf of St. Lawrence and off Nova Scotia. European vessels continued to concentrate on cod and discard other species. The Spanish, however, fished haddock during the mid-1950s when this species was abundant on the Grand Bank and St. Pierre Bank (Regier and McCracken, 1975).

There were significant changes in the species sought by the Canadian fishery. Offshore trawlers fished for redfish and various flatfish species that they had not fished previously. Haddock became an important species in the Canadian fishery. The Canadian offshore fishery shifted from a hook and line fishery from dory vessels to a fishery by offshore vessels using otter trawls. The Europeans increased their use of otter trawls and pair trawls (Regier and McCracken, 1975).

Landings from the area off the Canadian Atlantic coast increased from 700,000 tons to 1,200,000 tons annually, with cod still comprising about 70 percent of the total.

The period from 1958-1968 was one of dramatic uncontrolled expansion in the Northwest Atlantic fisheries. The most significant event was the arrival of the USSR fleet in the Northwest Atlantic and rapid expansion of its activities. The USSR was followed by other Eastern European countries (Poland, Romania, German Democratic Republic and Bulgaria). Other West European countries (the Federal

Republic of Germany, Britain and Norway) also joined in the rapidly escalating fishery.

The appearance of the USSR fleet on the scene added a new dimension to the fishery. The USSR was interested in fishing any species or stock which was of sufficient size to feed the appetite of its massive fleet. It engaged in what became known as "pulse fishing." This meant that a large amount of fishing effort was directed at a particular species in a given area until it was reduced to a low level of abundance and then the fleet moved on to another species or another area (Regier and McCracken, 1975).

The catch by the USSR in the ICNAF Convention Area increased from 17,000 tons in 1956 to 370,000 tons in 1962 and doubled to 853,000 tons in 1965. It increased further to a peak of 1,357,000 tons in 1973. This high level of catches was sustained by a remarkable shift in the species composition of the catch over time. The main species sought shifted over time from redfish, to cod, to silver hake, and herring and then in the 1970s to capelin, mackerel and silver hake.

During this period the fishery diversified. A winter fishery for northern cod developed off the east coast of Newfoundland and Labrador. A fishery for herring developed offshore. Flatfish fisheries expanded on the Grand Banks. In addition to traditional groundfish species, the USSR developed fisheries for such species as argentine, grenadiers and silver hake. Canadian fishermen also diversified with more intensive fishing of herring, redfish, flatfish and pollock.

This era witnessed major changes in the methods of fishing. The major developments were the introduction of stern trawlers, factory trawlers for processing fish at sea, purse seining and midwater trawling for pelagic species, and more efficient fish-finding techniques. Overall, major technological developments in the fishery occurred within a very short time span (Regier and McCracken, 1975).

The introduction of stern trawler/factory trawler technology to the Northwest Atlantic during the 1960s by the USSR and other countries changed dramatically the scale and nature of the offshore fishery in this area. By 1970 there were about 900 freezer trawlers and factory trawlers over 1,000 tons in the world's fishing fleets, of which about 400 belonged to the USSR, 125 to Japan, 75 to Spain, 50 to West Germany, 40 to France and 40 to Britain (Hjul, 1972).

New technology and greatly increased fishing effort resulted in a rapid increase in catches until 1968. Total Northwest Atlantic nominal catches increased from about 1,800,000 tons in 1954 to a peak of 4,600,000 tons in 1968, with much of that increase occurring during the 1960-1968 period (Figure 3-1). Catches in ICNAF (NAFO) Subareas 2-4, which approximate catches off the Canadian coast, increased from 1,400,000 tons in 1962 to a peak of 2,700,000 tons in 1968. Canadian catches peaked at about 1,300,000 tons in 1968.

During this period expansion was uncontrolled. The tonnage of vessels fishing in the Northwest Atlantic (excluding vessels less than 50 tons) increased dramatically from about 400,000 tons in 1959 to a peak of around 1,500,000 tons in 1974 (Figure 3-2). Despite a continued increase in fishing effort from 1968 to 1974, total Northwest Atlantic catches declined to about 4,200,000 tons in the early 1970s. In the area off the Canadian coast (Subareas 2-4) catches declined steadily from the 1968 peak of 2,700,000 tons to less than 1,500,000 tons by 1977. Canadian catches from the Northwest Atlantic, which had also peaked in 1968, declined from 1,300,000 tons to less than 850,000 tons in 1974 and 1975.

Off the Canadian Atlantic coast groundfish had been the major component of the catch, particularly in the offshore fishery. Groundfish catches off the Canadian Atlantic coast peaked at 2,000,000 tons in 1968, then declined to less than

Fig. 3.1 Northwest Atlantic nominal catches (Subareas 2-4 are ICNAF/NAFO statistical areas off the Canadian Atlantic coast).

Source: ICNAF, NAFO, DFO Statistics

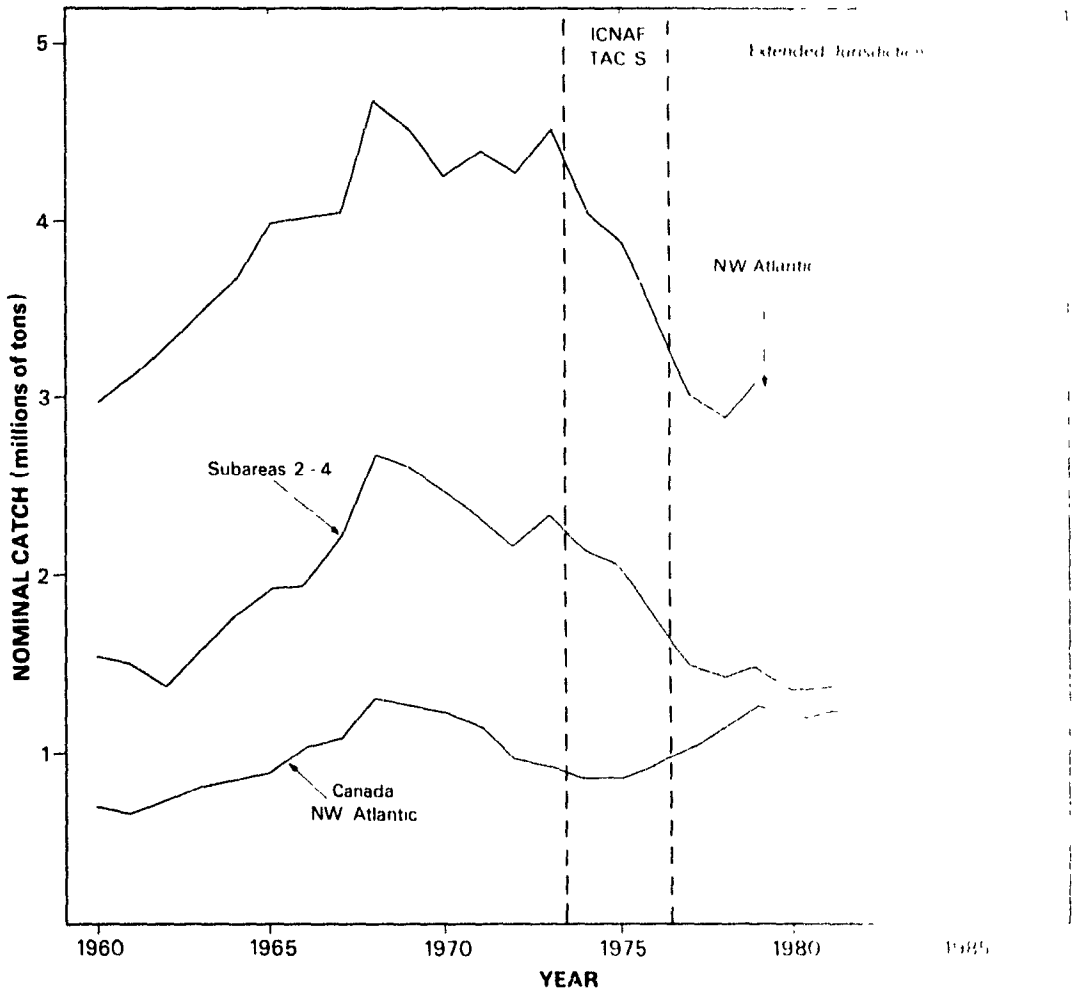
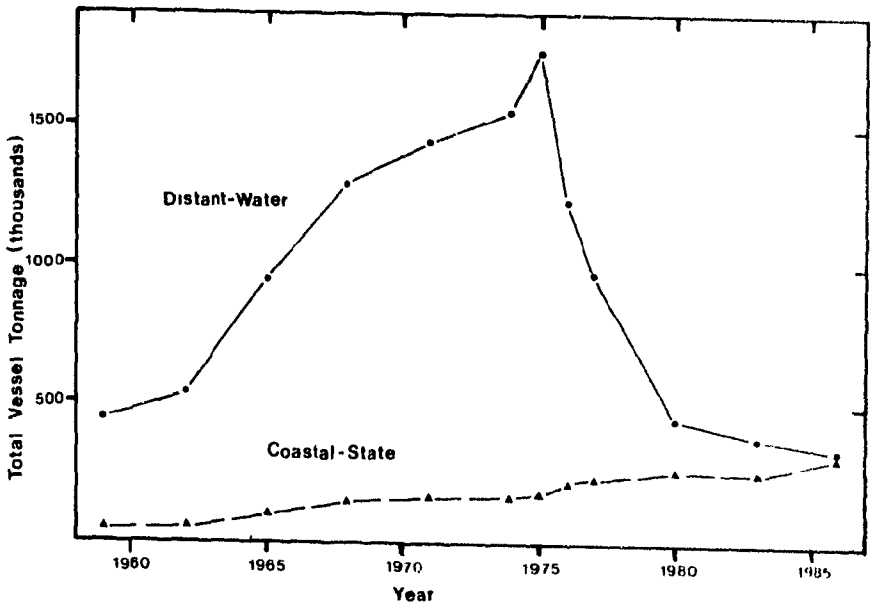

ICNAF
TAC S
NW Atlantic
Subareas 2 - 4
Canada
NW Atlantic
NOMINAL CATCH (millions of tons)
5
4
3
2
1
1960
1965
1970
1975
1980
YEAR

Fig. 3.2 Aggregate gross registered tonnage (GRT, tons) of fishing vessels deployed in the northwest Atlantic by distant-water and coastal-state fleets. Vessels less than 50 GRT are excluded.
"Coastal state" includes fleets of Canada, the United States, Greenland and St. Pierre and Miquelon
"Distant water" vessels are those whose home ports are outside the Northwest Atlantic

Source: ICNAF/NAFO Statistics, Pinhorn and Halliday (1990)


Total Vessel Tonnage (thousands)
1500
1000
500
Distant-Water
Coastal-State
1960
1965
1970
1975
1980
1985
Year

1,000,000 tons by the mid-1970s. The Canadian groundfish catch peaked at 620,000 tons in 1968 and then declined to a low of 418,000 in 1973.

The declines in catch did not reflect fully the extent of the decline in the stocks because of the continued increase in fishing effort until 1975. Canadian offshore trawlers had been experiencing declines in their catch per day fished from a peak of around 12-13 tons per day during the 1960-1966 period to about 10 tons per day in 1972 (Figure 3-3). By 1974-75 the catch per day fished had declined to about eight tons per day. This reflected a precipitous decline in the abundance of the major groundfish species, particularly cod.

Inshore fishermen were also experiencing the effects of the increased fishing pressure offshore. The most dramatic illustration of this was the decline in the inshore cod fishery along the northeast coast of Newfoundland and Labrador. Catches by inshore fishermen from this stock declined from 159,000 tons in 1959 to 97,000 tons by 1969 and then plunged to a low of 35,000 tons in 1974 (Figure 3-4). This had a dramatic negative impact on the social and economic fabric of the hundreds of coastal communities whose fishermen were dependent upon fishing northern cod for their livelihood.

The decline in catches and catch rates led to pressure on the Canadian government to bring foreign overfishing under control. The chief avenue available to Canada in the late 1960s was multilateral action through ICNAF. The evolution of the ICNAF regulatory regime has been described in some detail by Parsons (In Press). The initial emphasis within ICNAF was placed on the study of the fish stocks in the ICNAF area. The initial regulatory efforts were aimed at minimizing the wastage of small fish through the imposition of minimum mesh sizes in the codend of otter trawlers.

In the mid-1960s ICNAF's scientific body, the Standing Committee on Research and Statistics (STACRES), advised that mesh size regulations were inadequate to control the amount of

Fig. 3.3 Average catch per day by Canadian otter trawlers.

Source: DFO Fisheries Research Branch, Ottawa

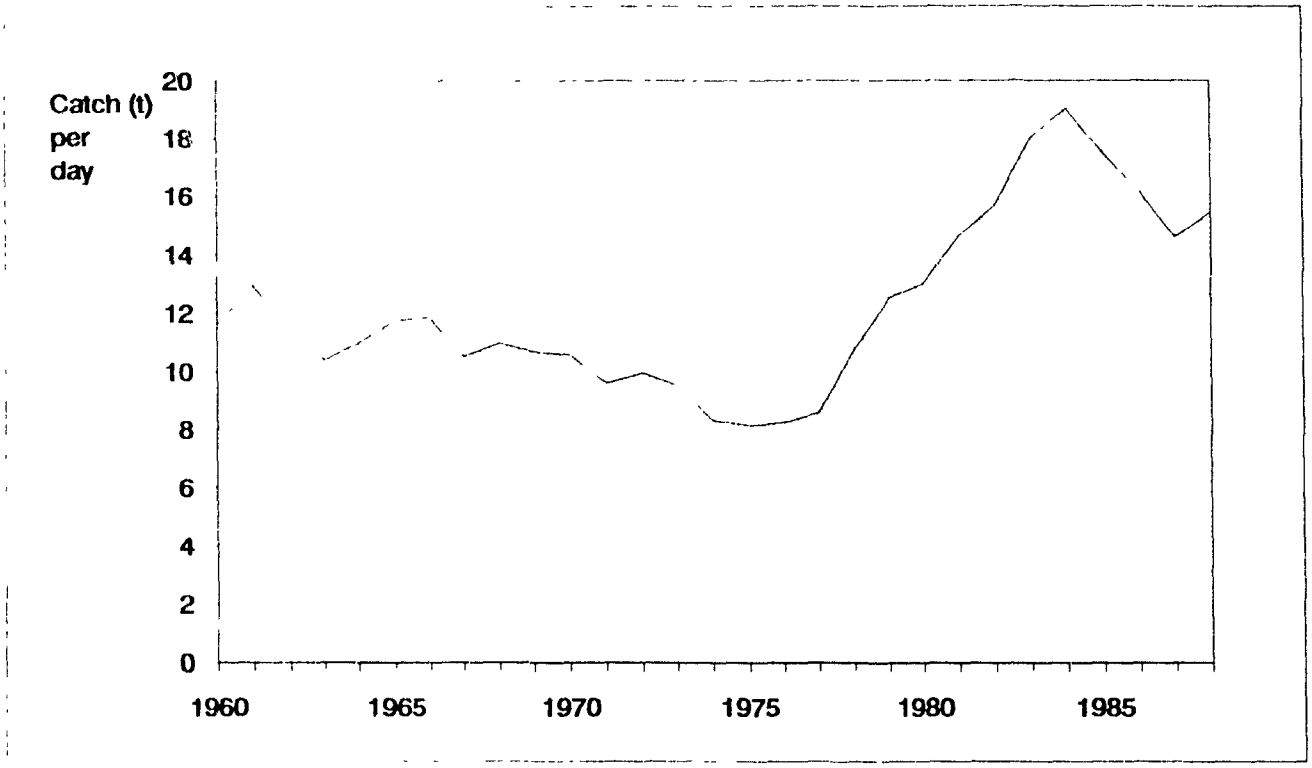
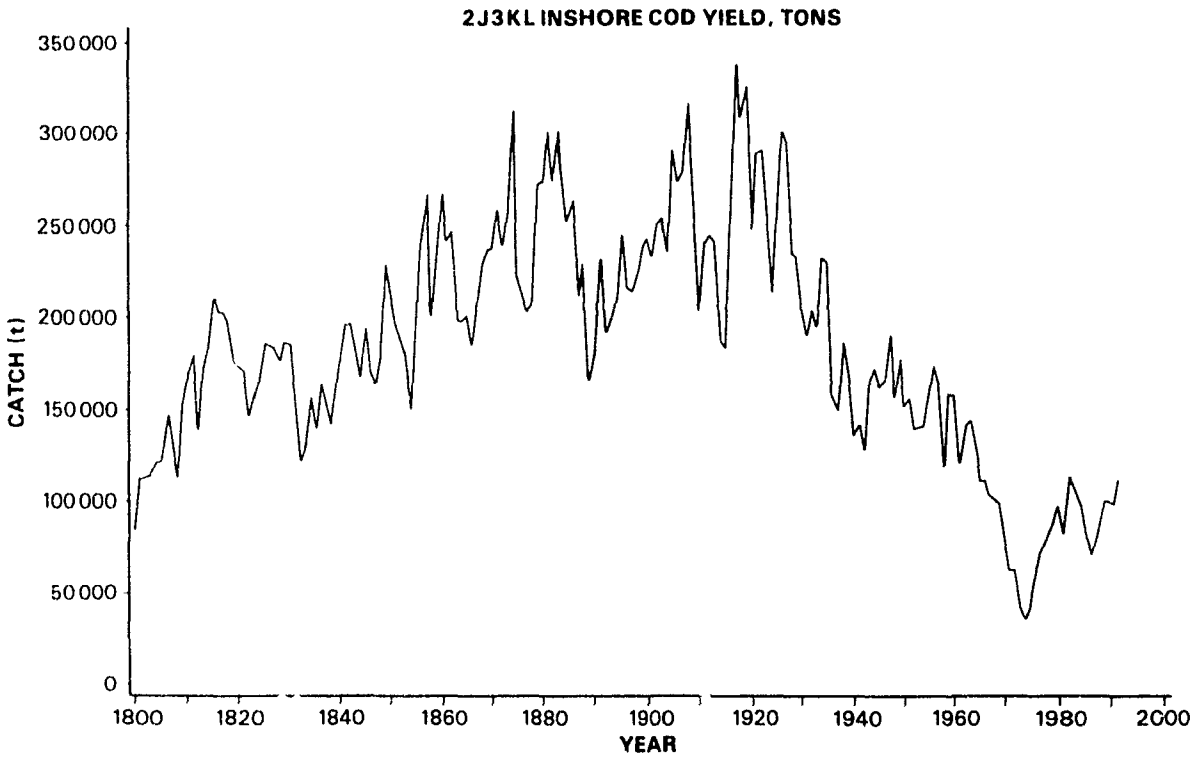

Catch (t) per day
20
18
16
14
12
10
8
6
4
2
0
1960
1965
1970
1975
1980
1985

Fig. 3.4 Trends in inshore catches of northern cod, 1800-1990.

Source: DFO Statistics, Ottawa


2J3KL INSHORE COD YIELD, TONS
350 000
300 000
250 000
200 000
150 000
100 000
50 000
0
CATCH (t)
1800
1820
1840
1860
1880
1900
1920
1940
1960
1980
2000
YEAR

fishing and that additional regulatory measures were required to arrest the dramatic escalation of fishing effort. Templeman and Gulland (1965) advised that there must be some direct control of the amount of fishing and advocated catch quotas as the most effective means of achieving this. In 1967, the ICNAF Working Group on Joint Biological and Economic Assessment of Conservation Actions called for "positive steps toward effort limitation." It too recommended the imposition of catch quotas allocated among countries (ICNAF, 1967). By 1968 and 1969 Canada and the U.S. were collaborating to persuade ICNAF to adopt a catch quota system.

Initially, ICNAF was hampered by a provision in the original convention which stipulated that all Panel member states which would be affected by a proposal adopted by the Convention had to agree to the proposal before it could come into effect for any member (there were five Panels each dealing with Subareas of the Convention Area). This procedure required active unanimity (Finkle, 1974). This obstacle was removed in theory in June 1964 when the Commission adopted a Protocol to the Convention which modified the original provision such that proposals became effective for all contracting governments six months after the date of notification from the depository government. Any contracting government affected by a proposal could present an objection within the six month period. A proposal then became effective for all contracting governments, except governments which had presented an objection. Ratification of this Protocol by all members did not occur until 1969.

ICNAF also moved to introduce an enforcement scheme allowing mutual inspection of catches and gear at sea. By a Protocol of June 7, 1963, relating to international enforcement, which entered into force December 19, 1969 and became operative July 1, 1971, the Commission adopted a Scheme of Joint International Enforcement (ICNAF, 1974). Under this Scheme each contracting government could appoint inspectors

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ICNAF also moved to introduce an enforcement scheme allowing mutual inspection of catches and gear at sea. By a Protocol of June 7, 1963, relating to international enforcement, which entered into force December 19, 1969 and became operative July 1, 1971, the Commission adopted a Scheme of Joint International Enforcement (ICNAF, 1974a). Under this Scheme each contracting government could appoint inspectors

with authority to board a foreign vessel employed in fishing in the convention area. The inspector would report any findings to the authorities of the flag state of the vessel concerned and to ICNAF. It was left up to the flag state to investigate and to impose penalties. Thus the Joint Enforcement Scheme was a tool with limited effectiveness. However, during the mid-1970s Canada was able to use it to detect evidence of violations and to bring pressure to bear on offending parties.

ICNAF agreed at its 19th Annual Meeting in 1969 to establish Total Allowable Catches (TACs) for haddock on the southern Scotian Shelf and Georges Bank. These were global TACs (ICNAF, 1969). It was clear, however, that for catch quotas to be embraced on a comprehensive basis there would have to be national allocations. In 1969, ICNAF adopted a proposal to amend the Convention to permit national allocation of catch quotas and to modify the Maximum Sustainable Yield objective to allow for proposals "designed to achieve the optimum utilization of the stocks." This amendment took effect in December 1971 (ICNAF, 1974a).

Immediately following this, a Special Meeting of ICNAF was convened in February 1972. This resulted in the adoption of global TACs and national allocations for herring in Subareas 4 and 5. At the 1973 Annual Meeting in Copenhagen, TACs were established (for 1974) for 56 finfish stocks in the Convention Area (ICNAF, 1973).

By this time, Canada, faced with the growing conservation threat off its Atlantic coast, had taken bolder unilateral action building upon the 1964 Territorial Sea and Fishing Zones Act. It was also seeking increased coastal state jurisdiction within UNCLOS III.

10. FISHERIES DEVELOPMENTS ON THE PACIFIC COAST DURING THE 1960s

Early bilateral and multilateral initiatives dealing with Pacific salmon have already been mentioned, e.g. the International Pacific Salmon Commission and the imposition of the abstention line to reduce Japanese interception of salmon of North American origin. This latter measure meant fewer salmon from streams of Canadian origin were being caught on the high seas, as distinct from interception in U.S. fisheries to the north and south of British Columbia.

The groundfish fishery off the B.C. coast was being prosecuted close to the coast in the Strait of Georgia, Queen Charlotte Sound-Hecate Strait and off the west coast of Vancouver Island. Japanese and USSR vessels began fishing groundfish off B.C. in 1966, mainly rockfishes, with an initial catch of about 45,000 tons. The Japanese then turned to blackcod using set line and the USSR to Pacific hake using midwater trawl. Canadian and foreign fishermen fished different species. The scale of the foreign fishery was far smaller than off the Atlantic coast.

As Canada approached the end of the 1960s, the dominant Pacific fisheries international concern was protection of Canadian salmon on the high seas and the development of mutually satisfactory salmon interception arrangements with the Americans. One of Canada's major international fisheries objectives had become the elimination of all high seas fishing by other countries for anadromous species originating in Canada. But the main pressure for extending Canada's fisheries jurisdiction seawards was being generated by the overexploitation of the groundfish resources on the Atlantic coast.

11. UNILATERAL PROCLAMATION OF FISHERIES CLOSING LINES-1970

By 1970 some fifty-seven states claimed a territorial sea of twelve miles or more (Johnson, 1977). In April 1970, the

Canadian government brought before Parliament two significant pieces of legislation - the Arctic Waters Pollution Prevention Act and an amendment to the Territorial Sea and Fishing Zones Act. The latter amendment established a twelve-mile territorial sea (effectively eliminating the nine-mile contiguous zone of 1964). It also authorized the establishment of new fishing zones. On December 18, 1970, the Minister of Fisheries and Forestry announced that "fisheries-closing-lines were being drawn across the entrance to the Gulf of St. Lawrence, the Bay of Fundy, Queen Charlotte Sound and Dixon Entrance-Hecate Strait" (External Affairs, 1970) (Figure 3-5a and 3-5b).

Minister Davis informed the House of Commons that the Government intended to conclude negotiations for the phasing-out of the fishing activities of countries which had traditionally fished in the areas concerned, namely, Britain, Denmark, France, Italy, Norway, Portugal and Spain (External Affairs, 1970). Canada had also entered into an agreement on reciprocal fishing privileges with the U.S. The activities of United States fishermen in the areas concerned would not be affected by the promulgation of the fisheries closing lines (Canada-USA, 1970). The fisheries-closing-lines approach pertained to fisheries jurisdiction rather than the complete sovereignty which states exercised in their territorial sea.

Following promulgation of the fisheries closing lines on the east and west coasts, phase-out negotiations were intensified and agreements reached by 1972 with all of the countries concerned. These agreements provided for the phase-out of Danish, Portuguese and Spanish fishing in the Gulf of St. Lawrence not later than the end of 1976 and U.K. fishing in the Gulf by the end of 1973. Fishing in the outer nine miles of the territorial sea would cease not later than the end of 1978. The Norwegian agreement provided for a separate arrangement regarding Norwegian sealing operations. This allowed Norwegian sealing operations in the Canadian

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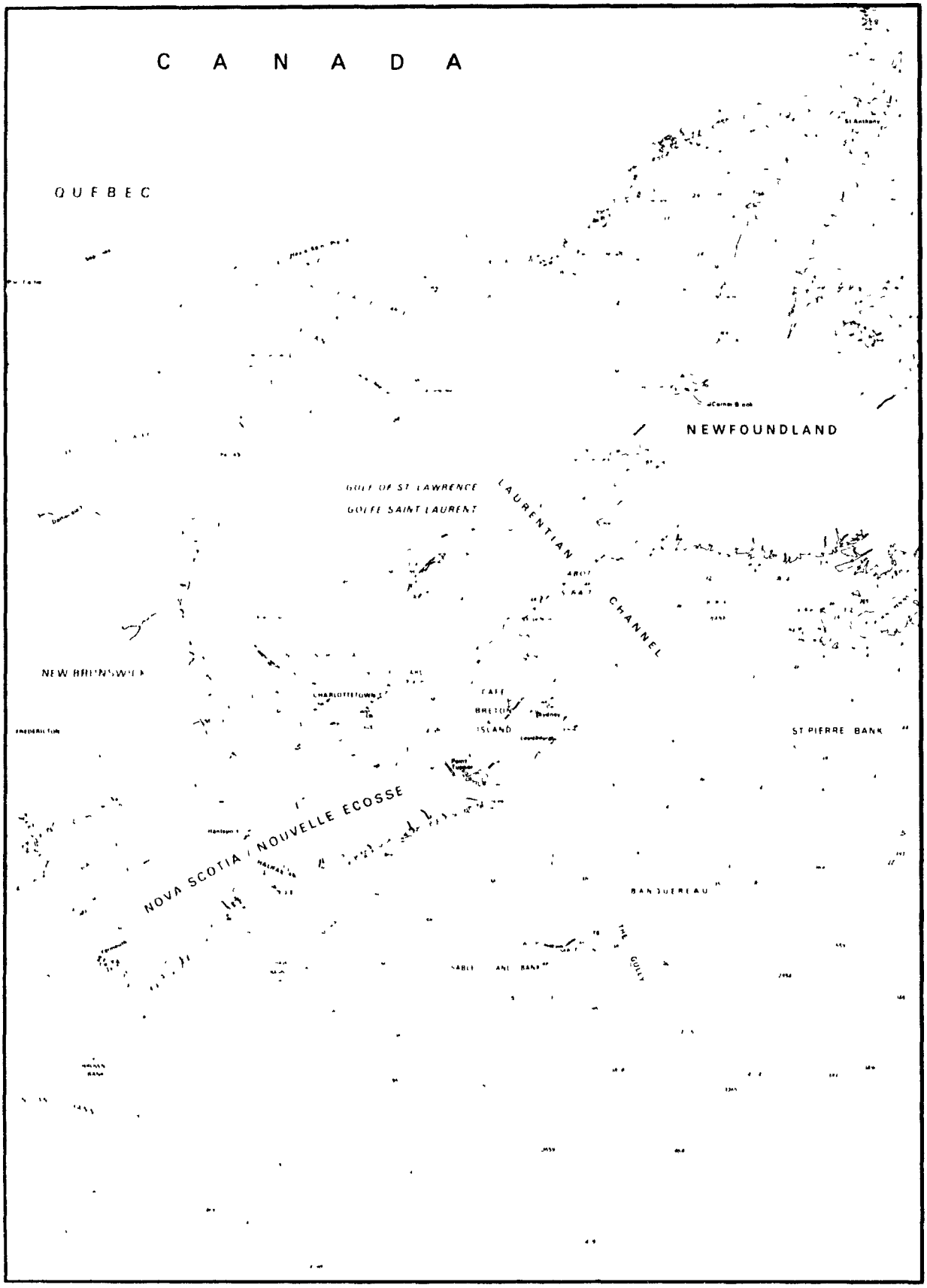
Fig. 3.5a Map showing 1970 Canadian Fisheries Closing Lines on the Atlantic Coast.

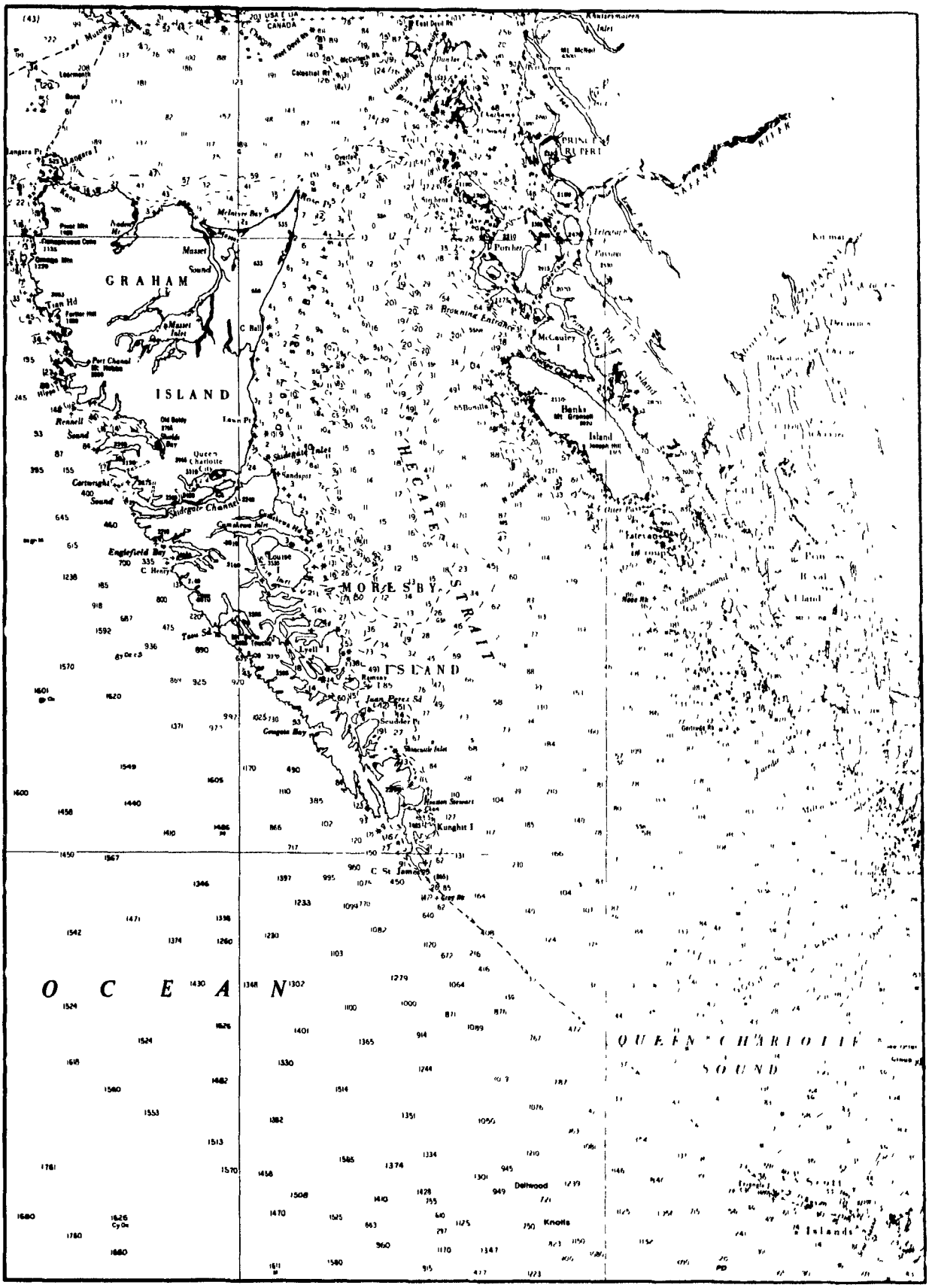
Source: Canadian Hydrographic Service, Ottawa



fisheries closing line

Fig. 3.5b Map showing 1970 Canadian Fisheries Closing Line on the Pacific Coast.

Source: Canadian Hydrographic Service, Ottawa



fisheries closing line

territorial sea on the east coast on an occasional and strictly regulated basis. These agreements essentially provided for the cessation of fishing within the Gulf or the territorial sea not later than the end of 1978. No agreement was negotiated with Italy because it had discontinued fishing off Canada's Atlantic coast (Legault, 1974).

One agreement was exceptional, that with France. France was recognized as having historic fishing rights. Also it had territory, the islands of St. Pierre and Miquelon, immediately adjacent to the Canadian coast. The 1972 Phase-out agreement with France, which was to become a thorn in Canada's side in the latter half of the 1980s, provided for:

1. The phase-out of fishing by Metropolitan France trawlers from the Gulf by May 1986;
2. Continued fishing by a maximum of ten trawlers registered in St. Pierre and Miquelon, with a maximum length of 50 meters, along the Newfoundland and Nova Scotia coasts, except the Bay of Fundy, and in the Gulf on an equal footing with Canadian trawlers in perpetuity; (Reciprocal rights were provided for Canadian trawlers along the coasts of St. Pierre and Miquelon);
3. An arbitration mechanism to settle disputes concerning the implementation of this agreement; and
4. Establishment of the territorial sea dividing line between Newfoundland and St. Pierre and Miquelon.

For a fuller treatment of this agreement and its subsequent implications for Canada, see Parsons (In Press).

12. COASTAL STATE PREFERENCE WITHIN ICNAF

In addition to these unilateral and bilateral actions, Canada was now asserting itself within ICNAF seeking preferential rights for the coastal state and a more effective conservation regime.

The ICNAF Convention had been amended to allow for national quotas. Canada and the U.S. pressed for more effective management action. In response, ICNAF over the 1972-1974 period moved to adopt Total Allowable Catches for all commercially important stocks within the Convention Area. Canada asserted a special preference for the coastal state in a statement on Northwest Atlantic Fisheries Policy, by the Honourable Jack Davis, in the House of Commons on May 25, 1972. He outlined two basic thrusts to Canada's approach at the upcoming ICNAF meeting in Washington: conservation and a special preference for the coastal state. With respect to conservation, he indicated that Canada would be urging a cut back in the offshore fishing effort by all nations and "a special allocation in Canada's favour, to improve the income of inshore fishermen in the Maritime provinces, Newfoundland-Labrador and Quebec." He enunciated the concept of a 40-40-10-10 sharing formula: "40 percent to be allocated to each nation in proportion to its latest three-year catch statistics; 40 percent reflecting its catches in the preceding ten year interval; 10 percent additional to the coastal state; and 10 percent to look after contingencies." (Canada, 1972).

This formula was adopted by ICNAF at the 1972 Annual Meeting as the basis for setting national allocations for 1973. Mocklinghoff (1973) noted that, when a considerable reduction of total catch became necessary, the shares of coastal states were reduced to a lesser degree than the shares of other states. By 1973 there was *de facto* acceptance of coastal state priority. The Canadian argument that it be permitted to harvest as much as it could catch was, however, not fully accepted by ICNAF until 1975. But the principle of coastal state priority had been accepted in a tangible form in 1972.

While Canada was moving within ICNAF to assert coastal state priority, it was also moving at the United Nations, in concert with other coastal states, to ensure that coastal

states would be assigned increased jurisdiction and management over the living resources adjacent to their coasts in a new Law of the Sea.

13. UNCLOS III

The process leading to the Third Law of the Sea Conference was launched when Ambassador Arvid Pardo of Malta made an eloquent speech to the First Committee of the UN General Assembly in which he spoke of the Common Heritage of Mankind and called for "an effective international regime over the seabed and the ocean floor beyond a clearly defined national jurisdiction" (UN, 1967). In December 1970, the UN General Assembly adopted a Declaration of Principles Governing the Sea-Bed and Ocean Floor Beyond the Limits of National Jurisdiction. This declaration stated that the seabed, its subsoil and its resource in the area beyond national limits were: "the common heritage of mankind.... The exploitation of its resources shall be carried out for the benefit of mankind as a whole, irrespective of the geographical location of states, whether landlocked or coastal, and taking into particular consideration the interests and needs of the developing countries." (UN, 1970a). The declaration called for an international regime to be established to govern all activities involving resources, including the orderly and safe development and rational management of the area, and the equitable sharing of benefits.

Another resolution called for a new conference on the Law of the Sea to be held in 1973. The range of issues would include the international regime for the seabed beyond national jurisdiction plus "the regime of the high seas, the continental shelf, the territorial sea (including the question of its breadth and the question of international straits) and contiguous zones, fishing and conservation of the living resources of the high seas (including the question of preferential rights of coastal states), the preservation of

the marine environment (including inter alia the prevention of pollution), and scientific research" (UN, 1970b). It was agreed that the Seabed Committee would meet during 1971 and 1972 in an attempt to draft a treaty encompassing all these issues. Canada was one of the 25 countries co-sponsoring the resolution calling for a third Law of the Sea conference.

The Seabed Committee, expanded to eighty-six members, worked assiduously during 1971 through 1973 in an attempt to produce draft treaty articles. Canada's interests in the work of the Seabed Committee and subsequently in UNCLOS III were broad and ranged far beyond fisheries. I deal here only briefly with the fisheries-related aspects of the Canadian position. An overview of the broad array of issues and Canada's evolving position concerning these can be found in Johnson and Zacher (1977), Buzan (1982), Hage (1984) and DeMestral and Legault (1979-80).

Canada took a leading role in seeking a new Law of the Sea to reflect the needs of coastal states, a group which Canada came to lead for a while at UNCLOS III.

On the domestic front, concern about the overexploitation of fish resources, about potential pollution of the marine environment, and related matters helped to shape the Canadian position. In January 1971, the Fisheries Council of Canada submitted a Brief to the Standing Committee on External Affairs and National Defence (FCC, 1971). The FCC advocated that the coastal state should have jurisdiction over the living resource of the Continental Shelf. There was one significant exception to this approach - anadromous species. "For these", the FCC stated, "we must have universal agreement that, a) anadromous species belong to the nation in whose territory they spend their fresh water phase, and b) no one will fish for anadromous species on the high seas." The FCC Brief presaged the key fisheries elements of the position Canada was to adopt at UNCLOS III.

Domestic pressure continued to mount in 1971, culminating in the formation of an east coast lobby group, the Save Our Fisheries Association (SOFA). Headed by Gus Etchegary of Fishery Products Ltd., the Association was made up of some 14 groups representing the fishermen's union, processors, municipalities, development associations and other organizations affected by the fishing industry. This Association, formed in Newfoundland, sought and received support from industry representatives in the Maritime provinces. It proposed that Canada make its position absolutely clear at the 1973 Law of the Sea Conference that, as a coastal state, Canada would not accept "anything less than full management control over the marine resources on the continental shelf by the end of 1973." (The Evening Telegram, October 12, 1971).

Also in the fall of 1971 the Nova Scotia Federation of Fishermen called on the federal government "to assert control over fisheries to the edge of the continental shelf to protect the livelihood of Maritime fishermen" (The Evening Telegram, September 27, 1971). These domestic pressures influenced both the Canadian position in ICNAF, where Canada staked out a claim to preferential rights, and Canada's emerging Law of the Sea position

Early on in the discussions in the Preparatory Committee at the United Nations widely divergent views were expressed. These ranged from the claims of many Latin Americans to a territorial sea of up to 200 miles to the views of the distant water states, who wished to minimize any extension of coastal state jurisdiction or powers. Canada initially favoured a substantial increase in coastal state powers over fisheries adjacent to its coast, and leaned toward preferential rather than exclusive rights for the coastal state. Its approach was described as <u>functional,</u> which meant the granting of authority to coastal states to carry out limited and specialized functions as opposed to sovereignty. Canada's position was

advanced in terms of "custodianship" and the "delegation of powers" to the coastal state (Legault, 1974).

Canada's Law of the Sea position was influenced by the fact that it has a large continental shelf, with an area amounting to almost 40 percent of its land mass. This is considered to be the second-largest continental shelf in the world, second only to that of the USSR. This continental shelf is narrow on the west coast but extends for several hundred miles off the Atlantic coast, up to 300-400 miles offshore in the vicinity of the Grand Banks. These factors influenced Canada's position. It did not see a 200-mile zone, along the lines proposed by the Latin Americans, as sufficient to protect its interests on the east coast because important fish stocks would straddle the outer 200-mile boundary. The driving force with respect to the west coast fisheries was the protection of salmon on the high seas.

For these reasons Canada adopted initially a <u>functional</u> approach which differentiated between groups of fish species based on their ecology, distribution and migratory behaviour. The four categories were sedentary species, coastal species, anadromous species and wide-ranging species. This approach was described in a statement to the Preparatory Committee by Dr. Needler, the Deputy Representative of Canada on August 6, 1971:

> "With regard to fish stocks in coastal areas, the Canadian delegation (proposes) a resource management system under which the coastal state would assume the responsibility and be delegated the required powers, for their conservation and management - as custodian for the international community under internationally agreed principles.... Most of the stocks which live out their lives in relatively shallow areas adjacent to the coast would come within the ambit for such a delegation of responsibilities and powers to the coastal states.... The special interests of the coastal state would require

provision to be made for preferential rights for the coastal states in the harvest of those species of particular socio-economic importance to the coastal population.

"A sound management system for salmon would require the delegation to the coastal states of the sole right to harvest the salmon bred in their own rivers.... Canada (favours) the prohibition of the fishing of salmon on the high seas.

"The management of (wide-ranging ocean species, particularly large pelagic fish and marine mammals) is best approached through international commissions" (Canada, 1971).

Under this approach, the coastal state would continue to enjoy exclusive sovereign rights to the sedentary species of the continental shelf.

Canada had difficulty in selling the species approach for fisheries and preferential rights over living resources to the edge of the continental shelf in the Preparatory Committee. There were a number of reasons why the initial Canadian position did not find favour with many other countries. Under a continental shelf/species approach, a substantial number of African, Caribbean and Asian states with narrow continental shelves would gain little. The African coastal states wanted a 200-mile limit and fixed boundaries, following a commitment made to their landlocked states in 1972. Another problem for developing countries was that highly migratory species, e.g. tunas, were often the major resource off their coasts. On the other hand, the linkage of fisheries jurisdiction with the continental shelf appeared similar in certain respects to that of the Latin American territorialist countries. This led to opposition from the Maritime states. By 1972 it was clear that coastal states, both developed and developing, were in favour of a much wider jurisdiction over fisheries in a defined zone, most likely 200 miles.

In November 1973, External Affairs distributed a Discussion Paper entitled Third United Nations Conference on the Law of the Sea, as background for consultations on the Canadian position prior to the commencement of the Conference. This paper maintained the species approach and the claim to preferential rights over living resources to the edge of the continental shelf (External Affairs, 1973).

UNCLOS III stretched over nearly a decade, from 1973 to 1982. Major steps forward on the fisheries issues occurred at the first substantive session in Caracas in the summer of 1974. The major issue addressed at Caracas concerned the limits of national jurisdiction. Canada and most other coastal states came to Caracas supporting expanded coastal state jurisdiction. While there were some Latin American states which were sympathetic to broad-margin states like Canada, the African states were insistent that the boundary should be fixed at 200 miles for all states. The crucial turning point at Caracas was the shift in position of three major Maritime powers, the USSR, Britain and the United States. These three states, along with Japan, had been among the leading opponents of extended fisheries jurisdiction. They had been under considerable external and internal pressure to accept the growing trend to a 200-mile economic zone. In 1974, all three announced that they would support 200-mile economic zones and national jurisdiction over the resources of the continental shelf where it extends beyond 200 miles.

Even though important differences of opinion still persisted, more than 100 states spoke out at Caracas in favour of a 200-mile exclusive economic zone. The surge towards the 200-mile zone was now irresistible. While Canada was pleased with the emerging acceptance of expanded coastal state jurisdiction over the living resources adjacent to its coasts, it continued to lobby for coastal-state management of stocks

between 200-miles and the edge of the continental shelf, and for a special provision for anadromous species.

Canada mounted a massive lobby at Caracas to educate other non-salmon states about the unique nature of salmon and the need for special treatment for anadromous species in the new Law of the Sea. Each delegation was presented with a beautifully bound copy of The Salmon, a book especially written for this purpose by the well-known Canadian author and sports fishing enthusiast, Roderick Haig-Brown (Haig-Brown, 1974). Sanger (1987) described how Haig-Brown and Leonard Legault of the Canadian LOS delegation collaborated on this book. It eloquently portrayed the plight of the Pacific and Atlantic salmon, their high seas migrations and the unique contribution of the state of origin to the survival and development of salmon stocks.

At the Geneva session in 1975 detailed fisheries provisions for the zonal concept were negotiated. Following the tabling of a proposal by a group led by Kenya, the coastal state group really coalesced. Canada, while maintaining its case for preferential rights beyond 200 miles, participated actively in drafting the fisheries provisions for a 200-mile zone, thus abandoning its earlier species/functional approach (A. DeMestral, McGill University, Personal Communication). At Geneva, committee chairmen were asked to prepare a set of draft articles based on their best assessment of a possible compromise position. These three sets were tabled during the last plenary meeting as the Informal Single Negotiating Text (ISNT), as a tool to further the negotiating process at the next session.

In terms of the fisheries issues, the maritime states had by now accepted the concept of an exclusive economic zone, rather than one involving preferential rights. The general direction of the ISNT was satisfactory to Canada, with the exception of the question of preferential rights for stocks beyond 200 miles. Canada was successful in securing agreement

on a draft article on anadromous species which, while it did not ban high-seas salmon fishing, stated the state of origin had ownership rights and provided a basis to limit high-seas salmon fishing.

Canada made further attempts to secure adequate provisions for conservation of stocks which overlap the 200-mile limit and the area beyond 200-miles. An article in the 1975 negotiating text provided that interested states would seek to agree on the measures to ensure the conservation of such stocks. In the end only Canada and Argentina were interested in strengthening this article. Sanger (1987) observed that the campaign by Canada and Argentina started too late, in 1980, after the margineers had won the battle for a broad definition of the continental shelf. This campaign on straddling stocks focused on an addition to Article 63, which treated the question of co-operation between two or more coastal states in conserving stocks straddling their zones. Some 16 countries co-sponsored an amendment in 1981 but there was significant opposition from Japan, the USSR, Spain, the U.S. and the EEC. During the final negotiating session, in April 1982, the straddling stocks amendment was shunted aside because it became linked procedurally with the USSR position on a compromise on the question of innocent passage by warships through the 12 mile territorial sea. It was dropped in order to break a deadlock on another issue, instead of being decided on its own merits (Sanger, 1987).

By this time events had in many respects overtaken the Law of the Sea Convention. As Hollick (1981) observed, the UNCLOS III negotiations fell broadly into two phases-the period up to 1976 and that from 1977 on. Up to and including 1976 the negotiations concerned the whole range of issues. After 1976, the problem of seabed mining became the only significant unresolved issue.

Buzan (1982) described Canada's policy, in terms of the fisheries provisions of the Law of the Sea Convention, as

highly successful. DeMestral and Legault (1979-80) attributed Canada's success at the Law of the Sea Conference to a combination of factors. These included:

1. An early identification of genuine, tangible interests in a broad range of issues, involving thorough discussion with interested parties within Canada;
2. The delegation spoke for a country united on the issues under negotiation;
3. This support was manifested by the attendance of Cabinet Ministers at the negotiations;
4. The formation of a capable delegation which was a closely coordinated multidisciplinary team: in many instances, members of the delegation had direct operational responsibility for the issues under negotiation;
5. Strategic decisions on the forging of alliances with other states with compatible interests. These included new negotiating relationships transcending Canada's traditional western-bloc alliances;
6. Canada's ability to seek compromises among divergent interests, despite its own clearly identified interests;
7. Clear skills of advocacy and negotiation on the part of Canada's representatives. This was well illustrated by the success on the anadromous species provision, despite the fact that only fifteen states had a genuine economic interest in salmon, with major conflicting interests at stake; and
8. A recognition that "the overriding objective on any negotiation should be to reach agreement and to promote that international community interest which lies in the accommodation of conflicting national interests."

14. EVENTS LEADING TO CANADA'S UNILATERAL EXTENSION OF FISHERIES JURISDICTION TO 200 MILES - 1974-76

By 1975 essential agreement had been achieved at UNCLOS III on the concept of the 200-mile exclusive economic zone. It was clear, however, that it would be several years before all issues could be resolved and a new Law of the Sea Convention adopted. Canada, therefore, came under increasing pressure to act unilaterally to declare a 200-mile zone.

This pressure was heightened by the failure of apparently successful initiatives within ICNAF to produce immediately tangible results. By 1974, a global Total Allowable Catch system had been adopted but the TACs were too high to arrest the stock decline which had been underway since the late 1960s.

The FCC in a January 1974 Brief to the Standing Committee on External Affairs and National Defence, while supporting the basic Canadian position at UNCLOS III, had further proposed that:

> "If the Law of the Sea Conference fails to establish a fisheries Convention which Canada can accept, Canada should unilaterally extend her exclusive fishing zones and management authority." (FCC, 1974)

The Minister of Regional Economic Expansion, Don Jamieson, told reporters in late June, 1974, that Canada would act unilaterally if the LOS Conference did not accept Canada's claim to a zone of 200-miles or to the limit of the continental shelf, whichever was greater. Mr. Jamieson said that "if the conference comes apart at the seams we can't let things go on the way they are now." (Globe and Mail, June 22, 1974). The Secretary of State for External Affairs, Mr. MacEachen, the Minister of Regional Economic Expansion, Mr. Jamieson, and the Minister of State for Fisheries, Mr. LeBlanc, attended the LOS conference in late August. On August 28, Mr. MacEachen stated that "based upon my

consultations with delegates here .. it will be possible to draw the main lines of a treaty next year and in light of that expectation unilateral action in pursuit of Canada's goals would be unwise while negotiations were continuing." (Ottawa Citizen, August 29, 1974). Mr. Jamieson stated that "it makes far more sense to get international agreement than to take unilateral decisions which may not be as beneficial in the long run." (Halifax Chronicle Herald, August 29, 1974).

In a speech to the Rotary Club in St. John's, on December 12, 1974, Mr. Jamieson, the senior Atlantic Cabinet Minister, excluded unilateral action because "we would find it extremely difficult and enormously costly to enforce a unilateral declaration against countries that might... challenge Canada's action." However, in the closing part of his speech he indicated that unilateral action was an option which "cannot be rejected forever." (DREE, 1974).

By May 1975 the Fisheries Council was calling for unilateral action. On May 9, the Secretary of State stated in the House that "unilateral action is one of the policy options open to the government, and it certainly is a lively option at present" (Canada, 1975a). However, on May 12, Mr. MacEachen indicated that the upcoming ICNAF meeting would deal with a Canadian proposal calling for a considerable reduction in fishing effort: "It would seem premature to consider any action of any kind until the results of that meeting are clear" (Canada, 1975b).

Canada pressed at the June 1975 ICNAF meeting in Edinburgh for a 40 percent reduction in foreign fishing effort off the Canadian Atlantic coast. ICNAF did not approve this request, claiming that further study was required.

ICNAF's reluctance to accept Canada's proposal resulted in further calls in the House for unilateral extension. The Newfoundland and Nova Scotia legislatures in late June, 1975, passed unanimous resolutions supporting unilateral action.

Responding to questions in the House on July 22, Mr. MacEachen stated:

> "The Law of the Sea Conference was not a failure,... the single negotiating text which was produced at the conference met almost all of the significant objectives which Canada had in the field of fisheries.... In the meantime, however, we as a government are considering as one of our options for future action the question of unilateral action.... It is not clear...that a simple declaration of unilateral action will, in fact, deal with the problem...I would want to be certain that taking that course would bring substantial benefit within a reasonable period to the east coast fishery" (Canada, 1975c).

The following day, July 23, Minister LeBlanc announced that Canada's Atlantic ports would be closed to Soviet fishing vessels effective July 28. Mr. LeBlanc indicated that this action was necessary because the Soviet fishing fleet was consistently overfishing the quotas set by ICNAF. Repeated attempts by Canada to bring these practices to a halt had met with no satisfactory response from Soviet authorities (DOE, 1975a).

In announcing the closure of Atlantic ports to the USSR fleet, Minister LeBlanc indicated that the Spanish and Portuguese fleets had also been involved in 'violations' using nets with undersized mesh and discarding large tonnages of species they did not want without keeping records as required by ICNAF. He indicated that Canada was making a direct approach to the Spanish and Portuguese governments and that "if the performance of their fleets does not improve immediately, our ports will be closed to them as well."

Spanish and Canadian officials met on August 6 and 7. In a Joint Communiqué on August 8, "both sides recognized that it was imperative to ensure strict fulfilment of obligations assumed under (ICNAF), particularly in light of serious

declines in the stocks." The Spanish officials indicated that they had recently met with representatives of the Spanish fishing fleet to bring about improved compliance with ICNAF regulations. It was agreed that under the ICNAF Scheme of Joint International Enforcement steps would be taken to enable Spanish fisheries inspectors to work with Canadian inspectors in securing compliance with ICNAF regulations (External Affairs, 1975a).

Provincial Premiers, meeting in St. John's, passed a resolution on August 22, 1975, calling on the federal government to proceed with a unilateral declaration to give Canada effective control over all commercial fishing within 200 miles off Canada's Atlantic coast (Globe and Mail, August 23, 1975).

USSR and Canadian officials met in Ottawa from August 25 to 27 to address the USSR overfishing/Canadian port closure issue. In a Joint Communiqué issued on August 28:

> "Both sides recognized that it was imperative to ensure strict adherence to and implementation of measures agreed within (ICNAF), particularly in light of the urgent need to maintain and restore the stocks" (External Affairs, 1975b).

It was agreed to recommend to the two governments the establishment of a "joint Fisheries Consultative Commission" to review problems, exchange information, facilitate enforcement cooperation and help prevent damage to fishing gear. The two sides further agreed "to ensure the prompt discontinuance of a fishery, when the national quota allocation for the stock in question has been taken."

Further meetings were held with officials of Portugal, Norway, Poland and a high-level meeting with the USSR prior to the Special ICNAF meeting in Montreal in September 1975. Mr. LeBlanc announced the reopening of Canada's Atlantic ports to the Soviet fishing fleet effective September 29, 1975. In a Joint Communiqué of September 26, Mr. Kamentsev, the USSR

First Vice-Minister of Fisheries, indicated that "the Soviet delegation supports Canada's proposals for a reduction in the fishing effort and lower Total Allowable Catches for certain stocks of groundfish in critical condition" (External Affairs, 1975c). Mr. MacEachen also stated that the Soviet Union would enter into a bilateral agreement with Canada in the future "covering fishing in an extended 200-mile Canadian fishing zone." He described this as "the most important single development in the fisheries field that we have been working on yet."

Through these bilateral meetings, Canada laid the groundwork for acceptance of its conservation and regulatory proposals at the Montreal Special ICNAF meeting.

At the September ICNAF meeting Canadian proposals for a 40 percent reduction in foreign fishing effort for groundfish species, for more stringent catch limits on six fish stocks in critical condition, and for Canada to be allocated higher percentage shares of the overall catches were accepted (DOE, 1975b).

In addition to the fishing effort regulation, another major result was the adoption of the $F_{0.1}$ approach[1] for setting TACs for certain critical stocks - the first sign of the abandonment of the MSY approach[2] of the past. This ICNAF meeting in September 1975 was a major turning point. Canada subsequently directed its efforts towards unilateral extension of fisheries jurisdiction in the context of the consensus which had emerged at the 1975 Geneva session of LOS.

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[1] $F_{0.1}$ A reference level of fishing mortality at which the increase in total yield achieved by adding one extra unit of effort in a fishery is equal to one-tenth the original catch per unit effort in the very lightly exploited fishery. (For fuller explanation, see p.p. 94 and 95)

[2] MSY Maximum sustainable physical yield from a fishery resource. See Chapter 3, Section 3.1.

In the summer of 1975 Canada launched upon the path of unilateral extension but with acceptance by the major fishing countries negotiated in advance. This was intended to minimize the problems of compliance which might be associated with a sudden, unexpected unilateral extension. The confrontation with the Soviet Union in July-August 1975 and the closure of Canadian Atlantic ports to the Soviet fleet, with accompanying threats of similar action to Spain and Portugal, were instrumental in setting the scene for the negotiation of bilateral agreements which secured acceptance in advance of a Canadian 200-mile limit.

Following the ICNAF meeting, Canadian negotiators intensified their efforts to put in place the framework of bilateral agreements that would make possible a smooth transition to a Canadian 200-mile limit. Norway was the ideal partner with which to start this series of agreements. Norway and Canada shared a common approach to coastal state jurisdiction and Norway had only a small fishery in the Canadian zone and Canada had none in the Northeast Atlantic.

On December 2, 1975, the Secretary of State for External Affairs announced the conclusion of an agreement between Canada and Norway on fisheries (External Affairs, 1975d). The agreement set out the terms and conditions that would govern continued fishing by Norwegian vessels in areas "to be brought under Canadian jurisdiction beyond the present limits of the Canadian territorial sea and fishing zones off the Atlantic coast." The Agreement permitted Norwegian vessels to fish in the area concerned, under Canadian authority and control, for resources "surplus to Canadian requirements." The key provision was Article II, which served as the prototype for later agreements with Poland, Spain, Portugal and the USSR. This Article provided for continued fishing by Norwegian vessels in an extended Canadian fishing zone "for allotments, as appropriate, of parts of total allowable catches surplus to Canadian harvesting capacity." It stipulated that Canada

would set TACs, determine the allocation of surpluses, and licence Norwegian vessels to fish in the Canadian zone.

Similar agreements were reached with Spain on February 20, 1976, Portugal on March 12, Poland on March 25, and the USSR on May 19.

The conclusion of the agreement with the USSR set the stage for the announcement of a decision which had been taken in principle by Cabinet in February 1976. The Secretary of State for External Affairs, Allan MacEachen, announced in the House of Commons on June 4, 1976, the Government's decision to extend Canadian fisheries jurisdiction out to 200 miles from the coast, effective January 1, 1977. He noted that the U.S. and Mexico were taking similar action effective in 1977 (Canada, 1976).

Mr. MacEachen noted that the agreements with Norway, Poland, the USSR, Spain and Portugal, in addition to the existing 1972 agreement with France, covered the major foreign fisheries off Canada's Pacific coast and "more than 88 percent of the foreign catch in that part of the ICNAF Convention area to be incorporated within Canada's 200 mile fisheries zone." He observed that these agreements would "provide for a smooth transition to the new regime of extended Canadian fisheries jurisdiction."

On June 8, 1976, in a speech at the opening of the 1976 Annual Meeting of ICNAF in Montreal, Fisheries Minister LeBlanc informed ICNAF members that "Canada is committed to allowing others to fish for stocks which may be surplus to Canadian capacity. For many stocks there can only be a surplus if the stocks are rebuilt. It is the process of rebuilding that the Government of Canada is preparing to devote itself now." (DOE, 1976a)

He stated that for 1977 Canada would determine within its 200-mile zone the conservation measures to be applied, the vessels which would be allowed to fish, and the allocations they would be allowed to take. As an interim measure, for 1977

only, Canada was prepared to give effect to regulations adopted within ICNAF with Canada's concurrence, by adopting and enforcing such regulations under Canadian law. He indicated that Canada might also adopt additional regulatory measures for 1977 but these too would take into account decisions within ICNAF and would be consistent with agreements reached at the ICNAF meeting with Canadian concurrence.

Minister LeBlanc also signalled Canada's intention to seek modification of the existing ICNAF arrangements to provide for continued multilateral cooperation regarding the management of stocks beyond 200 miles. Canada served notice of its intention to withdraw from ICNAF on December 31, 1976, in order to preserve its options, but indicated that it would not necessarily proceed with withdrawal.

At the 1976 ICNAF meeting Canada secured the further reductions in TACs that it considered necessary and the adoption of the F_{01} reference level as the guide post for management. For many stocks inside the Canadian 200-mile zone, including most of those off Nova Scotia, only Canadian fishermen would be able to fish in 1977. For groundfish traditionally fished by Canadian fishermen, the TAC for all nations combined was decreased from 956,600 tons in 1976 to 668,500 tons in 1977, a reduction of 30 percent. Foreign fleets would absorb nearly all the quota reductions on these stocks. Their total share would decrease by 47 percent, with the reduction for some countries being as high as 68 percent (ICNAF, 1976a).

For these same groundfish stocks, the Canadian quota increased very slightly to 339,600 tons in 1977 from 336,000 tons in 1976 but the Canadian percentage share increased from 35 percent in 1976 to 51 percent in 1977.

ICNAF agreed to meet again in Tenerife, Spain, in December, 1976 to consider TACs and national allocations for seven stocks deferred pending further scientific information.

It also established a working group whose members, on a personal basis, would recommend possible future arrangements for international fisheries cooperation in the Northwest Atlantic.

The December Special Meeting of ICNAF adopted, by a large majority, amendments to the ICNAF Convention proposed by Canada. These amendments in effect recognized that Canada had the right to manage fisheries within the Canadian 200-mile zone effective January 1, 1977. The Commission would no longer have any management functions within this zone. It would continue its management functions for fisheries beyond the 200-mile zone. The meeting also agreed that action be taken as soon as possible in 1977 to develop new multilateral arrangements in line with the new jurisdictional realities (ICNAF, 1976b). ICNAF was thus the first international commission to adapt itself to extended fisheries jurisdiction.

15. CONCLUSION

In a relatively brief period the concept of freedom of the high seas, which had prevailed for centuries, was dramatically altered by the work of the Third United Nations Law of the Sea Conference and the widespread unilateral extensions of coastal state jurisdiction to 200 miles in the mid-1970s. This change was prompted in large measure by the recognition that the living resources of the world's oceans could be, and in many cases were being, fished down to levels where fishing was no longer economically viable. In some cases the very survival of particular fish stocks was threatened.

Although Canada extended its fisheries jurisdiction to 200-miles unilaterally, in advance of a fully agreed Law of the Sea text, it did so in concert with many other countries. Also, it had carefully prepared the way for acceptance of its unilateral extension by negotiating a series of bilateral agreements with the principal countries fishing off its

coasts. Those agreements ensured that Canada's jurisdiction over its new zone would be respected, at least in principle.

Consensus on a 200-mile zone came none too soon for Canada. Many of its important fish resources were threatened by excessive fishing pressure. While some progress had been made in the international fisheries commissions in addressing this, generally the measures adopted by these commissions were "too little, too late". The new 200-mile fisheries zone provided Canada with the opportunity to take more aggressive management actions in support of its fisheries management objectives. To achieve this, it was necessary to put in place a new management regime for the 200-mile zone. In the next chapter I examine the nature of that management regime.

CHAPTER IV

THE CANADIAN MANAGEMENT REGIME FOR THE 200-MILE ZONE

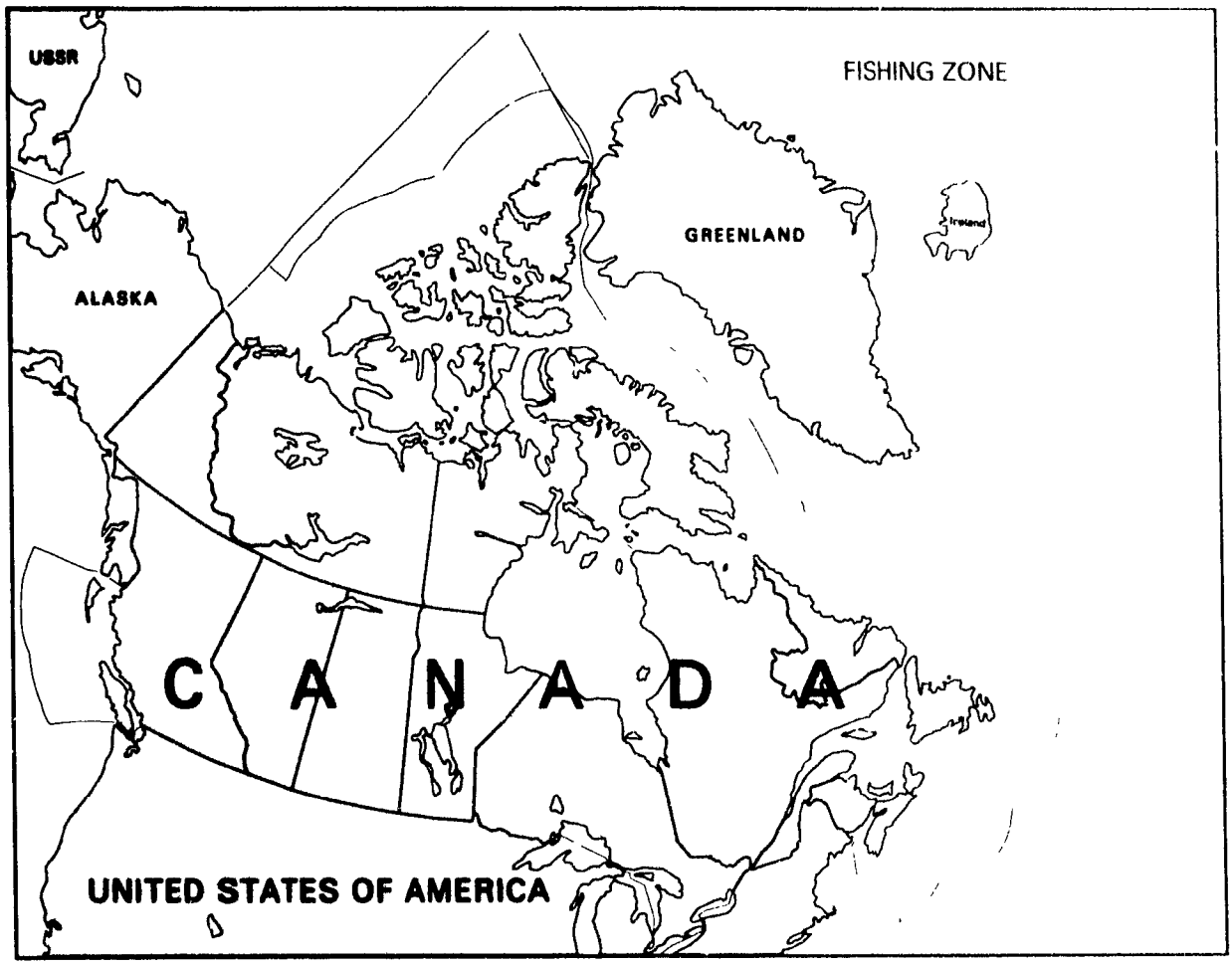
1. INTRODUCTION

The new Canadian 200-mile zone encompassed 503,000 square miles on the Atlantic coast and 129,000 square miles on the Pacific coast. Fishing occurred in only about 40 percent of the new zone because except for the Grand Banks off Newfoundland the new zone extended beyond the edge of the Continental Shelf particularly on the Pacific coast. The immediate challenge facing Canada in January 1977 was the orderly management of foreign fisheries in this new zone and the continuation of efforts already initiated to rebuild fish stocks which had been overfished despite the previous multilateral fisheries arrangements.

2. LEGAL STATUS OF THE 200-MILE ZONE

The legal implementation of the Canadian 200-mile fisheries zone was a simple step since the Territorial Sea and Fishing Zones Act of 1964 provided the necessary enabling legislation. The 200-mile zone was given legal effect through an Order in Council, dated November 2, 1976, which proclaimed two new Canadian fishing zones (Zone 4 on the Atlantic and Zone 5 on the Pacific coast) effective January 1, 1977 (Canada, 1977a) and in the Arctic (Zone 6) on March 1, 1977 (Canada, 1977b) (See Figure 4-1). The Order in Council contained the geographic coordinates defining the fishing zones in which Canada would be exercising fisheries jurisdiction. The Canadian claim, which extended up to a 12-mile territorial sea around St. Pierre and Miquelon and overlapped the U.S. claim published in the Federal Register on November 4, 1976, raised obvious boundary delimitation issues.

Fig. 4.1 Map illustrating the Canadian 200-mile limit.
Source: Canadian Hydrographic Service, Ottawa


USSR
FISHING ZONE
GREENLAND
Ireland
ALASKA
C A N A D A
UNITED STATES OF AMERICA

The Canadian Order-in-Council made reference to boundary delimitation talks with the U.S.,France and Denmark and stated that the limits of the Canadian fishing zones as defined in the order were "without prejudice to any negotiations respecting the limits of maritime jurisdiction in such areas." The evolution of Canada's fisheries relations with Denmark, France and the U.S. in the post-extension era is described by Parsons (In Press).

Following the worldwide adoption of the 200-mile zone concept in 1976 and 1977, efforts continued to secure a comprehensive Law of the Sea Convention. The fisheries provisions had been largely settled by 1976. Negotiations on the regime for the exploitation of the mineral resources of the deep seabed and the formation of an International Seabed Authority for the area beyond national jurisdictions over the continental shelf continued for the remainder of the decade. The election of President Reagan in 1980 precipitated a crisis as the U.S. government undertook a wide-ranging review of its Law of the Sea policy. This resulted in a tough new U.S. stance at the Law of the Sea negotiations. As a result the U.S. rejected and voted against the Convention, even though substantial concessions were made by other parties in the last weeks of UNCLOS III. Despite the U.S. opposition, the Convention was signed by 119 states and organizations in a ceremony at Montego Bay in December 1982. The Convention was open for signature for two years; during that period the number of signatories increased to 159 but these did not include the United States, Britain and West Germany. However, the European Economic Community signed the Convention on behalf of its members with respect to fisheries and marine pollution. The Convention will enter into force when 60 countries have ratified it. As of December 1990, 49 countries had ratified the Convention.

Thus, at the beginning of the 1990s, the Law of the Sea Convention and the 200-mile exclusive economic zone concept

were still not codified in international law. However, given the widespread adoption of 200-mile zones around the world in the 1970s, there is little doubt that the 200-mile zone is now customary international law. Scovazzi (1985) argued:

> "Owing to widespread acceptance, within a few years the 200-mile fishery zone acquired the status of a customary rule of international law and many coastal states, great maritime powers included, completed their shift towards extended marine jurisdiction by proclaiming exclusive economic zones."

Evensen (1985), who played a major role in negotiating the Law of the Sea Convention, stated:

> "The concept of the 200-mile economic zone has gained such worldwide acceptance in the practice of states, jurisprudence and international law literature that it in all probability today must be considered as forming part of the established principles of international law basically by reason of its general acceptance by the international community".

Some states have proclaimed 200-mile exclusive economic zones; others have proclaimed 200-mile fisheries zones. Canada's proclamation of a 200-mile zone fell in the second category. It utilized the existing Territorial Sea and Fishing Zones Act to proclaim three new fishing zones. Thus Canada's 200-mile fishing zone falls short of the Law of the Sea Convention's provisions respecting an Exclusive Economic Zone. According to the 1982 LOS Convention, the coastal state has sovereign rights in a 200-mile Exclusive Economic Zone for the purpose of exploring and exploiting, conserving and managing the living and non-living resources of the waters superjacent to the seabed and the seabed and its subsoil. In the Exclusive Economic Zone, the coastal state also has jurisdiction with regard to the establishment and use of artificial islands, installation and structures, marine scientific research and the protection and preservation of the

marine environment. While Canada has exercised many of the provisions pertaining to an Exclusive Economic Zone, it has not legally proclaimed such a zone.

Early in UNCLOS III there was considerable debate about whether the new 200-mile zone would be regarded as territorial sea or high seas. In the end, it was agreed that the 200-mile Exclusive Economic Zone would be *sui generis*, i.e. unique, combining elements of both the territorial sea and the high seas. While the coastal state exercises certain sovereign rights in the Exclusive Economic Zone (or Fishing Zone), it also has obligations with regard to the rights of other states in the EEZ, e.g. freedom of navigation and overflight (Sanger, 1987). Thus, the Canadian 200-mile zone is "neither fish nor fowl" but a different form of animal combining features of both.

3. THE CANADIAN GOVERNMENT'S POLICY OBJECTIVES

In the two years prior to extension of fisheries jurisdiction Canada had adopted a new set of objectives for management of its marine fisheries.

3.1 Maximum Sustainable Yield versus Maximum Economic Yield

The pursuit of an ideal set of objectives for fisheries management is like the search for the Holy Grail - much sought after but elusive. Since the first attempts at active fisheries management in the last century many conflicting objectives have been proposed for the management of particular fisheries. From the middle of this century to the mid-1970s, a debate raged between those who favoured a biologically-based physical reference point for management (MSY) and those who advocated maximizing the net economic yield (MEY). From the mid-1970s onwards, both of these concepts were replaced in Canada and the U.S. by the more ambiguous concept of Optimum Yield or Optimum Sustainable Yield. This was considered by its proponents to accommodate more flexibly the diverse range

of conflicting objectives involved in managing any fishery (DOE, 1976b; Roedel, 1975).

An earlier view that the management of fisheries concerned essentially the conservation of fish resources has been generally replaced worldwide by a broader view of fisheries as an economic activity encompassing a broad spectrum of individuals, processes and interests. The fisheries system includes the resource base, the harvesting and processing sectors (primary and secondary industry) and the utilization of those resources in the marketplace.

The basic concepts of marine fisheries management evolved just before and immediately after World War II based on the work of Graham, Russell and others and were summarized by Russell in a 1942 monograph on The Overfishing Problem (Russell, 1942). The concept of Maximum Sustainable Yield had its origins in the simple biological models of stocks of single species of fish. The apparent simplicity of the concept was attractive to international fishery managers. Throughout the 1940s and 1950s the theory and practice of MSY became widespread. It was embodied in the 1949 Convention setting up ICNAF. The aim of ICNAF was "to make possible the maintenance of a maximum sustained catch from the fisheries" (ICNAF, 1974a). MSY became the reference point for management in other international fisheries commissions during the 1950s and 1960s (Larkin, 1977).

By 1964 and 1965, ICNAF scientists were warning that direct control of the amount of fishing was required in order to maintain fish stocks at the level corresponding to MSY (ICNAF, 1964; Templeman and Gulland, 1965). The first steps in this direction were taken with the establishment of Total Allowable Catches (TACs) or catch quotas for two haddock stocks for 1970. With the introduction of an amendment to the ICNAF Convention which provided for allocation of catch shares to member countries, the first national allocations were set for herring for 1972. The objective of the ICNAF Convention

was also modified to "optimum utilization", allowing economic and technical, as well as scientific, considerations to be taken into account (ICNAF, 1974a). By 1974 all of the major groundfish stocks of the ICNAF area were placed under a system of Total Allowable Catches and national allocations. These initial TACs were established at the calculated MSY or F_{max} level. F_{max} is the level of fishing mortality which will produce the maximum yield per recruit. It ignores recruitment fluctuations.

Neither Canada nor the USA believed that the single-species MSY approach was adequate (ICNAF, 1974b, 1975a, 1976a). The USA was successful in achieving the adoption of a second-tier TAC and catch quota system for the southern part of the ICNAF area (Subareas 5 and 6) to control the overall level of exploitation (O'Boyle, 1985). This measure was in effect from 1974-76 and represented the first significant departure from the single-species MSY approach.

At Canadian insistence, ICNAF entered into discussion of fishing effort controls (ICNAF 1975a). At the 1975 ICNAF meetings Canada was successful in securing the adoption for 1976 of a regulation requiring the reduction of fishing effort by non-coastal states by approximately 40 percent from that observed in 1972-73 (ICNAF 1975b).

By this time Canadian managers regarded the MSY/F_{max} approach as inadequate. MSY was the dominant objective for three decades because the concept in its simple form was fairly readily understood by fisheries managers and fishermen. Also the idea of catching the maximum sustainable yield was a goal which was most readily acceptable internationally to countries with divergent economic, social and political goals. For those countries concerned with the maximum production of food, MSY was a useful target to ensure a continuing maximum supply of food from the sea. MSY also had the additional advantages that it took into account concerns about biological

overexploitation, as these were then understood. At the same time management measures based on MSY resulted in minimal declines in fishing effort and hence employment. MSY was thus acceptable as a management objective to most fishermen and governments.

The apparent simplicity of the MSY concept is deceptive (Gulland, 1968, 1977). The MSY concept does not take account of multispecies interactions, either in terms of the effects a fishery for one stock has upon other stocks or biological interactions among the species being fished, e.g. cod and herring, or cod and capelin. The latter could be either in the form of a predator-prey relationship or competition for food. Under the MSY approach, a particular stock is regarded as though it were in biological isolation, with the only factor upsetting the equilibrium situation being the fishery for that stock. This of course is a gross oversimplification of what happens in the oceans. However inadequate our knowledge, these interactions should in principle be taken into account.

The effect of natural variability in fish stock abundance unrelated to the effects of fishing also complicates the MSY concept. Under stable conditions pursuing the MSY approach might produce the desired results. Under environmental conditions which affect the productivity of a stock adversely, stocks may collapse if the level of fishing is maintained at the theoretical MSY level. The theoretical relationship of sustainable yield to fishing effort does not hold in such circumstances. Environmental fluctuations can cause changes in the relationship such that the effort which produces MSY one year may have a considerably different impact in another year, resulting in overexploitation or underexploitation from a MSY perspective. In the case of substocks of species, a general MSY can result in the overexploitation and sometimes the extinction of less productive substocks; this has been

demonstrated in the case of Pacific salmon and herring and may well hold true for other species.

But the chief criticism of MSY was that levelled by fisheries economists (Gordon, 1954; Scott, 1955; Christy and Scott, 1965). The MSY concept is a purely physical one which considers only one output, the magnitude of the catch. It takes no account of the value of the catch nor the cost of catching it. Economists and some biologists (e.g. Gulland, 1968) have argued that at the maximum the curve of catch against fishing effort is flat and hence the marginal increase in catch by increasing the fishing effort by maybe 20-30 percent is very small. It makes no sense to increase the effort by twenty per cent to increase the catch by two per cent. Economists suggested that the objective should be to obtain the greatest net economic yield from a fishery by fishing at the point where the difference between the value of the catch and the costs of catching it is at a maximum, hence the concept of Maximum Economic Yield (Anderson, 1986).

It is possible to calculate the fishing mortality which will maximize the net economic yield for a given set of circumstances, if the necessary biological and economic data are available. This can, however, be complicated by a variety of factors particularly when there are a number of countries, or different types of vessels from one country, participating in a fishery.

Gulland and Boerema (1973) proposed that a more objective method of calculating a desirable fishing mortality would be to consider the increase in total yield achieved by adding one extra unit of effort. The marginal yield will be equal to the slope of the tangent to the curve of catch against fishing effort. It will always be less than the catch per unit of effort (CPUE). The simple economic optimum occurs when the value of the marginal yield is equal to the marginal costs of a unit of effort. Gulland and Boerema (1973) pointed out that it would be undesirable to increase the amount of fishing

beyond the level at which the value of the marginal yield is small compared with the costs of the extra unit of effort required to produce that yield. Considering what marginal yield might be regarded as small, they noted that an arbitrary figure used for advice on the management of Georges Bank Herring (ICNAF, 1972) was a marginal yield equal to one-tenth of the original catch per unit effort in the very lightly exploited fishery.

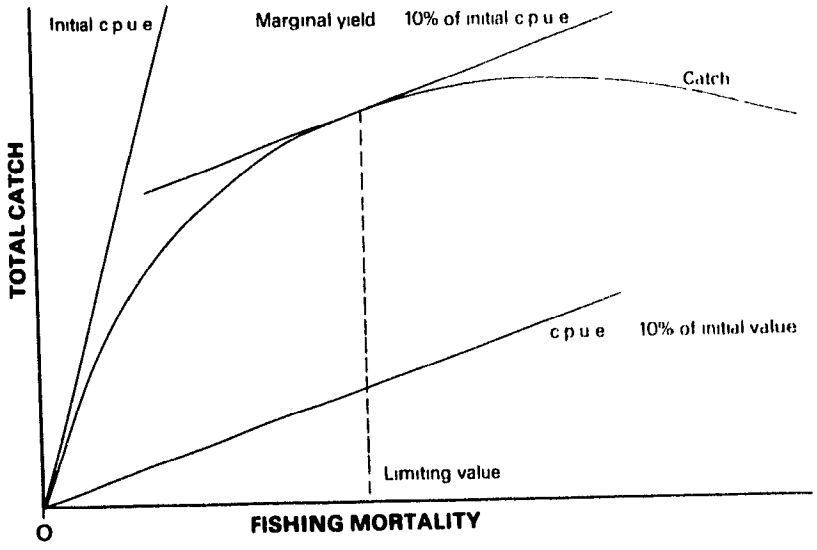
The calculation of this is illustrated in Figure 4-2. There are two straight lines through the origin which show the catch per unit of effort in the lightly exploited fishery (the tangent to the catch curve at the origin) and a catch per unit of effort of 10 percent of this. The point where the tangent to the curve is parallel to this 10 percent line represents a limiting point beyond which any increase in fishing effort (mortality) would not be worthwhile. This point has become widely known in the scientific and management literature as the $F_{0.1}$ reference level of fishing mortality.

Following the adoption of the $F_{0.1}$ concept for herring in the ICNAF area in the early 1970s, Canadian managers began to press in 1975 for a strategy of fishing below F_{max} for the Atlantic groundfish stocks. They persuaded ICNAF to agree in 1976 on TACs set at the $F_{0.1}$ level for 1977. These were, in effect, transitional measures since coastal state jurisdiction in 1977 had already been announced.

The stage had been set for this shift in management objectives by the ICNAF Standing Committee on Research and Statistics (STACRES) which had, at the Seventh Special Commission in September, 1975 (ICNAF 1976c) pointed out that the F_{max} reference point had potential limitations which had to be recognized. STACRES noted that the setting of TACs at the F_{max} level could lead to severe reduction in stock size, reduction in the number of age-groups in the exploited stock,

Fig. 4.2 An illustration of the situation where the marginal yield is 10 percent of the initial catch per unit of effort.

Source: Adapted from Gulland and Boerema, 1973


Initial c p u e
Marginal yield
10% of initial c p u e
Catch
TOTAL CATCH
c p u e
10% of initial value
Limiting value
O
FISHING MORTALITY

large short-term changes in catch (and hence in the magnitude of the short-term changes which must be made in the TACs) and possible recruitment failures due to the generation of too low spawning stock sizes.

The Committee concluded: "A lower fishing mortality rate than F_{max} can be set which would result in only a small loss in average catch but would achieve a substantially higher average stock biomass, greater stock stability due to the presence of a larger number of age-groups in the exploited phase, higher average catch per unit effort, and increased economic efficiency." F_{01} was suggested as a possible reference level of fishing mortality to achieve these benefits (ICNAF, 1976c).

While Canada was taking action within ICNAF to put in place a management framework to provide for resource rebuilding, the Canadian Atlantic groundfish industry was in crisis because of the combination of declining catch rates and a downturn in the U.S. market for groundfish. Because of the severity of the crisis the federal government intervened with a Groundfish Bridging Program ($140 million in assistance over three years) while the state of the industry was examined by a Task Force headed by Mr. Fern Doucet, a Special Advisor to the Minister of Fisheries. The Doucet team, formed in December 1974, studied every aspect of the industry.

From the fire of the 1974-76 crisis a new set of objectives for the management of Canada's commercial fisheries was forged. This was articulated in the May 1976 Policy for Canada's Commercial Fisheries (DOE, 1976b). This document set forth a broad view of the interdependent components of the fisheries system. It indicated clearly that the extension of fisheries jurisdiction would not by itself solve the industry's problems: "Extended jurisdiction should be seen as being as much a challenge as an opportunity, and in facing up to that challenge we should always keep in mind that the

fortunes of the fishing industry depend on more than fish. They depend on markets, on production costs, on the industry's built-in ability to compete, and on a myriad (of) other factors."

The 1976 document proposed two major shifts in policy:

1. The guiding principle in fishery management would no longer be maximum sustainable yield but the best use of society's resources, with "best use" defined as the sum of net social benefits (personal income, occupational opportunity, consumer satisfaction and so on) derived from the fisheries and the industries linked to them.
2. While private enterprise, individual, cooperative and corporate, would continue to predominate in the commercial fisheries, fundamental decisions about resource management and about industry and trade development would be reached jointly by industry and government.

The long-term viability of the industry was considered to depend on "getting rid of certain structural defects, notably catching and processing over-capacity, dispersal of processing facilities, and fragmentation of business organization." These changes would have to be made gradually and systematically, while minimizing the disruptive impact of change. The document stipulated: "Where adverse social side-effects, such as reduced employment opportunities can be kept within acceptable limits, restructuring should proceed. Where damage to the community would outweigh advantages in the short run the changes must be postponed."

Reduced employment in harvesting was identified as one requirement for a viable commercial fishery. However, the document was quick to add that this would not mean drastic dislocation of the people dependent on the fishing industry. Rather, where it was feasible to expand, this expansion should be accomplished without increasing employment in the fishery.

In the case of Pacific salmon the key to development involved dealing with the threat to salmon from environmental degradation of their freshwater and estuarine habitat and increasing salmon numbers through enhancement technologies. In the case of both Atlantic groundfish and Pacific salmon, necessary first steps were the setting up of an effective international management regime and a system to control access to the resource.

The 1976 Policy was the first comprehensive attempt to propose policy objectives for the entire fisheries system from the water to the table. While it lacked specificity it did provide a framework of multiple objectives arising from the diverse nature of Canadian fisheries. The 1976 Policy set the scene for ambitious management initiatives immediately following Canada's extension of fisheries jurisdiction in January 1977.

4. THE NEW MANAGEMENT REGIME

A Task Group on Extended Fisheries Jurisdiction had been established within the Fisheries and Marine Service of the Department of Fisheries and the Environment in April 1976 to develop plans for the management of both foreign and domestic fisheries in the new zone[1]. This group developed a regulatory regime for the control of foreign fishing which was implemented through new sets of Coastal Fisheries Protection Regulations and Foreign Offshore Fishing Regulations. It developed plans for the surveillance and enforcement of the 200-mile limit to ensure compliance with the new Canadian regulatory regime, and for a significantly increased research effort, particularly in the area of resource assessment.

Canada had extended its jurisdiction in the context of the developing consensus at UNCLOS III. The final text of the

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[1] - I served as a member of that group.

Law of the Sea Convention, signed in 1982, sets forth in Section V the provisions respecting the exclusive economic zone. Articles 61 and 62 define coastal state rights and obligations under this regime. These do not differ greatly from the provisions in the Revised Single Negotiating Text under discussion at the time Canada extended its fisheries jurisdiction.

Article 61 dealt with the conservation of the living resources and Article 62 with the utilization of the living resources. These articles established the framework for setting total allowable catches, the factors to be taken into account, the coastal state's right to determine its harvesting capacity and provisions for determining the allocation of surpluses. Article 62 also set forth the obligation of other States to comply with the conservation measures and other laws and regulations of the coastal State. The scope of such regulations was suggested.

4.1 Regulation of Foreign Fishing

These two Articles, quoted in full in Appendix I, established the context in which Canada was now operating as a coastal State. Canadian rules governing foreign fishing were established in the Coastal Fisheries Protection Regulations made under the Coastal Fisheries Protection Act, (R.S.C. 1985, c. C-33) and the Foreign Fishing Vessel Regulations, made under the Fisheries Act (R.S.C. 1985, c. F-14). The Coastal Fisheries Protection Regulations covered the basic control aspects of foreign fishing, including licensing, reporting procedures, vessel identification requirements (Coastal Fisheries Protection Regulations, C.R.C. 1978, c.413 (as amended)). The Foreign Fishing Vessel Regulations (C.R.C. 1978, C.815 (as amended)) contained the operational restrictions on foreign fishing including quotas, gear restrictions and closed areas.

Canada treated 1977 as a transitional year by adopting the TACs and national allocations agreed to in ICNAF during 1976. Each foreign fishing vessel and each service vessel was required to have a licence in order to operate in the Canadian 200-mile zone, with the exception of certain exemptions for French and American vessels. Canada had passed transitional regulations exempting French vessels from the licensing provisions of the Coastal Fisheries Protection Regulations in ICNAF Division 3Ps, in the region of St. Pierre and Miquelon. The licensing exemption applied to U.S. vessels in the area south of 63° N and seaward of three miles.

These foreign fishing licences specified what kind of fish could be caught, what areas could be fished, the quantity that could be caught and a variety of operating conditions. Each country was required to submit a fishing plan in the early autumn for their proposed fishery in Canadian waters during the following year. These plans had to conform to the national allocations assigned by Canada. The plan had to include the numbers of fishing and support vessels identifying type of vessel, fishing capacity, area to be fished, species to be fished, time of year when fishing was planned, and amount of fishing effort to be applied (number of days on ground, number of days fishing).

These plans were then reviewed by Canadian technical experts to ensure that the planned amount of fishing effort was reasonable in light of anticipated catch rates and the available allocation. This meant that Canada was applying both a catch quota and a fishing effort regulatory system to the foreign fleets, hence making it easier to ensure compliance with the regulatory system through monitoring of days on ground and days fishing. These fishing plans were reviewed in bilateral meetings with representatives of each nation. These discussions often focused on the determination of the appropriate catch rate for a species, type of vessel

and area. Following approval of the fishing plans, each country was required to submit licence applications with a fishing plan for each vessel.

To facilitate surveillance and enforcement, vessels were required to report in by radio 24 hours before entering and 72 hours before leaving the Canadian 200-mile zone. Vessels were required to report location, catches, discards and other operational information by radio at least once a week. Vessels were also required to carry certain types of markings for identification.

During the transition year 1977 no licence fees were charged. Foreign licence fees were introduced in the second year of extended jurisdiction. The fee system introduced in 1978 consisted of a combination of an access fee for all fishing vessels and service vessels, which amounted to $1.00 per gross vessel ton. The second component was a fishing fee of eight cents per gross ton per day for each day on the fishing grounds. (These fees were increased in later years).

In the first year of extended jurisdiction 551 foreign fishing vessels were licensed on the Atlantic coast and 46 on the Pacific, as well as 160 support vessels.

4.2 Surveillance and Enforcement

4.2.1 Immediate Post-Extension Arrangements

Canada faced the challenge of demonstrating that it could police effectively the 200-mile zone. It had been preparing for these responsibilities for some time. In March 1976, the federal Cabinet had approved a five-year plan for fisheries surveillance and enforcement involving the coordinated deployment of vessels of the Fisheries and Marine Service, aircraft and ships of the Department of National Defence and vessels of the Department of Transport. An additional $4 million per year was diverted to offshore surveillance and enforcement for a total of $12 million per year commencing in fiscal 1976-77.

The additional funds were intended to enable:

1. An increase in Tracker aircraft patrols from 2000 to 4000 hours per year;
2. A doubling of offshore ship time to 1,650 sea days on the Atlantic and 495 days on the Pacific;
3. Air surveillance once weekly of sensitive fishing areas; (Flying hours would total 3,750 per year on the Atlantic coast and 480 hours on the Pacific); and
4. The boarding of vessels offshore, with foreign vessels to be boarded at least four times per year, and Canadian vessels at least twice per year. The objective was to board and inspect one third of the foreign fleet and one-sixth of the Canadian fleet each month.

At that time the Department of Fisheries and the Environment had eight vessels deployed on the Atlantic coast and three on the Pacific coast, but not all of these were capable of true offshore patrols. Sixteen Tracker aircraft plus three squadrons - six aircraft each - of long range Argus were used on the Atlantic coast and three Trackers plus another squadron of six Arguses on the Pacific.

Canada was able to maintain a credible presence in enforcing the 200-mile limit in the early years of extended jurisdiction. During the first year 900 inspections were conducted on foreign vessels and 170 on Canadians. Fourteen convictions were obtained against foreign captains for violating Canadian regulations. The major challenges to Canadian authority came later in the 1980s, with incursions of foreign vessels, particularly Spanish, into the Canadian zone on the Grand Banks. This resulted in increased surveillance and new enforcement approaches. There were also problems on the east coast with incursions of American vessels into the Canadian zone followirg the boundary delimitation of Georges Bank by the International Court of Justice in 1984. The

evolution of Canada's approach to surveillance, enforcement and compliance of both the foreign and domestic fleets in the years following extension is discussed in more detail by Parsons (In Press).

To assist in managing the foreign fleet, Canada developed a comprehensive computerized data management system called FLASH (Foreign Licensing and Surveillance Hierarchical Information System). This system processed information from foreign fishing licences, data acquired through surveillance and inspection activities and weekly catch and position reports submitted by foreign vessels. Computer terminals in St. John's, Halifax and Vancouver were linked to a central computer in Ottawa. The information in the central computer was updated daily in the Regions. Regional offices could determine from the system the status of any vessel, the current fishing activity, or the level of catch within any quota. Surveillance air crews and inspectors going to sea on the patrol vessels were briefed using reports produced from FLASH.

4.2.2 Components of the Enforcement Program

The objective of fisheries enforcement is to achieve compliance with fisheries management regulations by deterring illegal fishing activity. Enforcement programs attempt to meet this objective by influencing the behaviour of fishermen. Fisheries enforcement/deterrence models involve a combination of the economic theory of criminal behaviour with the bioeconomic theory of fisheries management. For a discussion of compliance/deterrence theory, see Becker (1968); Blewett, Furlong and Toews (1987); Sutinen and Hennessey (1987); and Hennessey and Kaiser (1987).

A comprehensive enforcement program has three basic elements:

1. The ability to detect infractions when they occur;
2. The capability to apprehend the violators; and

3. The imposition of penalties or sanctions as deterrents.

The enforcement process can be subdivided into two spheres of activity:

1. Monitoring, Control and Surveillance (MCS)
2. Sanctioning

DFO's monitoring and surveillance program has four distinct yet integrated components:

1. Sea Surveillance
2. Observer Program
3. Air Surveillance
4. Dockside and Quota Monitoring

An analysis of the effectiveness of offshore fisheries surveillance operations in 1980 resulted in recommendations for increasing penalties under the Fisheries Act and the Coastal Fisheries Protection Act, revised operational goals for offshore fisheries surveillance and proposals for additional resources to meet these revised goals (Clough, 1980).

The following revised operational goals were adopted:

1. that observers be placed on board 100 percent of non-USA foreign vessels and 50 percent of USA and domestic trawlers over 65 feet in length;
2. that three percent of all offshore fishing vessels should be sighted daily on the east coast and two percent on the west coast;
3. that fifteen percent of all offshore vessels not carrying observers should be boarded monthly; and
4. that a presence should be maintained over fishing grounds that are intersected by the fishing zone closure lines or the 200 mile limit.

The 1980 analyses indicated that a mix of approximately 1200 offshore sea-days, with observers on all foreign vessels and at least 20-30 percent of domestic vessels over 65 feet would provide a credible deterrent on the Atlantic coast,

excluding Flemish Cap and the far north (Davis Strait). The patrol sea-day requirement for Flemish Cap and Davis Strait was estimated to be 150 sea-days for an overall Atlantic offshore total of 1350 patrol sea-days.

4.2.2.1 Sea Surveillance

Patrol vessels provide platforms from which fishery officers conduct inspections of fishing vessels and take direct enforcement action to apprehend violators. Officers check fishing gear for compliance with mesh size regulations, patrol closed areas and enforce size limits.

The offshore patrol effort averaged 1225 sea-days from 1977 to 1979, compared with the 1980 estimated requirement of 1350 sea-days for the Atlantic coast.

As a result of the 1980 study, it was decided to establish a basic offshore fleet of four large Atlantic offshore patrol vessels to provide about 1000 sea-days. The balance was to be supplied by DND or Coast Guard vessels. In 1990-1991, DFO operated four large offshore vessels and one intermediate-size vessel, the Louisbourg, providing 1297 offshore patrol sea-days. On the surface, these met the requirements estimated in 1980.

Since that time, however, there have been dramatic changes in the Atlantic offshore fishery. The growing presence on the Nose and Tail of the Grand Bank through the 1980s of foreign vessels not licensed to fish in the Canadian zone resulted in an increased requirement for almost constant patrol vessel coverage of these sensitive boundary areas. Thus, the two existing offshore patrol vessels based in Newfoundland have been almost exclusively dedicated to the task of patrolling these areas, at the expense of coverage of the traditional offshore fisheries within the Canadian zone. In 1990 it was concluded that a third offshore vessel was required in Newfoundland to ensure regular boardings of the domestic fleet. This was achieved by obtaining 100 sea days

from the Canadian Coast Guard and 150 additional sea days from DND (L. Strowbridge, DFO, St. John's, Personal Communication).

4.2.2.2 The Observer Program

One of the key components of the DFO enforcement process since the mid-1970s has been an observer program on both the Atlantic and Pacific coasts. The program was primarily scientific. It originally targeted foreign fleets but, over time, was extended to the Canadian offshore fleet.

The first bilateral agreements covering observers on foreign vessels in the Maritimes Region were signed with the USSR and Cuba in 1977, and a small observer program was initiated. The Atlantic Foreign Observer Program grew from a small start in 1977 to 5520 observer sea-days in 1978, to 7768 sea-days in 1979 and 11,235 sea-days in 1979-80 (D. Kulka, St. John's, Personal Communication).

In the late 1970s an observer program was also initiated on the Pacific coast. The Pacific program was different from the Maritimes and Newfoundland programs in several respects:

1. It was much smaller in scale (270 observer sea-days in 1979 and 170 observer sea-days in 1980);
2. The observers were all permanent government employees;
3. Gathering biological data was the paramount function.

The Atlantic observer program had two objectives: (1) collection of data for resource assessment, and (2) deterrence. Deterrence was accomplished mainly by the presence of an observer on the fishing vessel, who was required to collect certain data, maintain records, report violations, and if necessary call for a boarding inspection and further action by a DFO Fishery Officer.

An observer could be intimidated or bribed. Accordingly, observers have to be checked. Thus, even vessels carrying observers need to be boarded occasionally.

The 1980 analysis indicated an Atlantic offshore observer sea-day requirement of 54,000 to 58,000 sea-days. This assumed coverage of the full foreign fleets and 20 to 30% of the domestic offshore fleet. On the Pacific coast it was suggested that the observer coverage should increase to 2200 sea-days annually.

The budget for the Atlantic observer program was increased from $1.6 million to $2.7 million in 1981-82 and thereafter remained static until 1986. By 1986, it was estimated that observer coverage was about 46-50% on licensed foreign vessels and 8% on domestic vessels, far short of the targets adopted in 1980. The static budget for the observer program had eroded coverage.

In 1986, as part of a package of measures aimed at enhancing Canada's surveillance and enforcement capability in the face of growing concern about foreign overfishing, the government decided to adopt a cost-recovery approach to the foreign observer program. This was intended to provide full observer coverage on licensed foreign vessels fishing in the Canadian Zone at no cost to the Treasury. Observers were employed by a third party contractor engaged by DFO. Foreign countries (or companies) were required to pay the observer company directly for the costs of mandatory observer coverage. A variation of this was utilized in the case of the USSR, whereby DFO instituted fees to recover observer program costs with the funds going to the Treasury Board which increased the Department's budget accordingly.

The recovery of foreign fleet observer costs through direct billing allowed an annual savings of $1.7 million. This was redeployed, beginning in 1987/88, to increase scientific observer coverage in the NAFO Regulatory Area outside 200 miles and to increase observer coverage on domestic offshore vessels in the Canadian Zone.

From 1987 onward coverage was extended to 100% for both the foreign fleet and certain domestic fisheries. Observer sea-days approximately doubled from 1986 to 1988 (Regulations and Enforcement Branch, DFO, Personal Communication).

4.2.2.3 Air Patrols

Air patrols represent the third major component of DFO's enforcement program. Air surveillance is effective for tracking fleet movements and helps to deter unauthorized fishing activity. Aircraft can survey large geographical areas, locate and track fishing fleets, detect violations and provide a visible presence. Aircraft often provide the first indication of illegal incursions by foreign vessels in boundary areas. Routine sightings information can be used to ensure that patrol vessels are being deployed to the areas where they are likely to be most useful.

The deterrence goal for air patrols adopted in 1980 translated into an operational requirement for the east coast of an average 1.5 sightings per vessel per month, averaged over all vessels, area and months. The operational requirement for the west coast was an average of 0.9 sightings per vessel per month.

To meet these air surveillance goals, it was estimated that about 5900 air-hours per year were required on the east coast and 1600 air-hours per year on the west coast. The actual air patrol level was 4995 air-hours on the east coast in 1977, 4995 air-hours in 1978 and 4377 air-hours in 1979. The west coast air patrol level was 1344 air-hours in 1977, 1327 air-hours in 1978, but declined to 826 air-hours in 1979 (Clough 1980).

Initially, air surveillance was provided exclusively by the Department of National Defence (DND). Tracker aircraft hours were purchased by DFO to provide short-range patrols while Argus aircraft (subsequently replaced by Aurora) met long-range requirements. Up until 1990 DND provided both the

Tracker and Aurora on a dedicated and multi-tasked basis through a combination of DFO - purchased and free air hours.

By 1986 it became apparent that new approaches were required. Although DFO was entitled to purchase up to 2250 hours annually of Tracker air time, the rapid escalation in the cost to DFO of DND incremental Tracker aircraft time had eroded the number of purchased air hours by about 25% since 1980. Air coverage had been further eroded by a relocation of the permanent Tracker base from Greenwood, Nova Scotia, to Summerside, Prince Edward Island. This location combined with increased costs had reduced "on task" time by as much as 72% in some sensitive patrol areas. (Regulations and Enforcement Branch, DFO, Personal Communication).

In the latter half of the 1980s DFO diverted portions of the fixed Atlantic air surveillance budget of $2.245 million to private sector companies in an effort to obtain more cost-effective air surveillance. By 1989/90 the total DFO annual air surveillance budget had been increased substantially from the previous $2.245 million to $5.750 million. The decision of the government to close the Summerside Air Base, announced in 1989, meant that the Tracker fisheries air surveillance capability would terminate. In October 1989, the government approved the expenditure of $28 million over five years to maintain the air surveillance capability previously provided by DND, and to augment air surveillance activities to more adequately monitor the foreign and domestic fisheries. The annual budget from 1990-91 to 1993-94 was established at $6.5 million (DFO 1989a).

4.2.3 Sanctions

The activities described so far are aimed at increasing the probability of detecting violations and apprehending violators. Catching violators is of little consequence unless they are sufficiently penalized to be deterred. If the perceived penalties and probabilities of detection and arrest

are low in relation to the perceived gains from illegal fishing, then the enforcement system is unlikely to deter violations.

Penalties can take the form of fines levied under the Fisheries Act or the Coastal Fisheries Protection Act (CFPA), and forfeiture of illegally caught fish or fishing gear and equipment (including vessels) used to commit an offence.

The primary statute used to control the domestic (Canadian) harvesting sector is the Fisheries Act, particularly sections 7 and 43. Section 7 authorized the Minister "in his absolute discretion" to issue licences or leases for fishing. Section 43 authorizes Cabinet to make regulations on a wide variety of matters pertaining to fishing. The Coastal Fisheries Protection Act (CFPA) provides the primary authority to control the harvesting of fish by foreigners in Canadian waters.

Fines levied under the Fisheries Act have generally been low. The use of licence suspension and forfeiture provisions in the Fisheries Act has varied over time. For a while during the 1980s there was increasing use of the ministerial authority to suspend and forfeit. However, once the implications of the Charter of Rights and Freedoms became clearer, questions arose whether an individual was being subjected to double jeopardy for the same offence. The use of licence suspensions and forfeitures decreased from 1985 onward, after the Fisheries Act was amended to more closely circumscribe the conditions under which a minister could exercise suspension and forfeiture powers. (Regulations and Enforcement Branch, DFO, Personal Communication).

Specific penalties respecting violations of Canadian fisheries violations by foreigners are established in the Coastal Fisheries Protection Act. Foreign fishing is governed both by the Coastal Fisheries Protection Regulations made under the CFPA and the Foreign Vessel Fishing Regulations made under the Fisheries Act. Relevant provisions of the Foreign

Fishing Regulations are also generally stipulated in the licence issued to a foreign fishing vessel. Thus, the penalty provisions of the CFPA, rather than the lower penalty provisions contained in the Fisheries Act, applied to foreign fishing activities. In addition to the general provisions of the CFPA, Section 13 of the Coastal Fisheries Protection Regulations provides that the Minister may suspend or cancel any licence or permit.

The CFPA provides for two categories of fines for summary conviction and for indictment and different fines depending upon the offence. The original Act (1952/53, C.15, s.I) provided for a fine of up to $5,000 on summary conviction or $25,000 on indictment for:

1. entering Canadian fisheries waters without authorization.

A lesser fine of $2,000 for summary conviction or $10,000 on indictment applied for

2. failure to "bring to" when required by a fishery officer or upon signal of government vessel
3. failure to answer a question on oath asked by an officer.

A violator was also liable to imprisonment for periods up to three months on summary conviction and two years or indictment, depending upon the nature of the offence.

In the early 1980s it became apparent that these penalty provisions were low relative to the potential gains a foreign vessel could obtain by fishing illegally. The Act was amended in June 1984 and the maximum penalties increased to $25,000 on summary conviction and $100,000 on indictment for illegal entry into the Canadian zone or unauthorized fishing, and $5,000 and $25,000 respectively for failing to "bring to", or resisting or obstructing a protection officer in the execution of his duty. The imprisonment option was retained only for a resisting or obstruction offence.

With the growing concern about foreign overfishing and the call by First Ministers for tougher action against violators, the Act was again amended in December 1986 to increase the maximum penalties to $100,000 on summary conviction and $500,000 on indictment for most categories of offences and $150,000 and $750,000 respectively for unauthorized fishing in the Canadian zone (DFO 1987a).

Thus, between 1983 and 1986, maximum penalties under the CFPA were increased substantially (thirty fold for incidents of unauthorized fishing).

Section 14 of the CFPA (R.S.C. 1985, c. 39 (2nd Suppl.) provides for forfeiture of any fishing vessel or "goods" used in the commission of an offence. The forfeiture of a fishing vessel is a potentially powerful sanction. Canadian courts have, however, been reluctant to forfeit fishing vessels for fisheries violations.

Under the Fisheries Act from 1977 to 1990, most fishing violations were subject "on summary conviction to a fine not exceeding $5,000 or to imprisonment for a term not exceeding twelve months or to both" (section 79.8 of the Act as amended in 1977). There was no provision for indictment for general fisheries violations. The 1977 version of the Act contained 14 sections setting out fisheries and habitat penalties.

More stringent penalty provisions were available for pollution of fish habitat up to $50,000 on summary conviction and up to $100,000 for second and subsequent offences. Again, there was no provision for indictment.

Various studies over the years (e,g. Clough, 1980; Blewett *et al*, 1987) concluded that these penalties, in particular, the $5,000 maximum fine for general offences under which most fish harvesting prosecutions fall, were much too low to provide an effective deterrent to violations of the Fisheries Act or regulations made under the Act. Fines levied under the Fisheries Act became a minor cost of doing business and in no way served to deter illegal fishing activity.

In 1991, the penalty provisions of the Fisheries Act were amended. The maximum fine for summary conviction was increased from $5,000 to $100,000, with an option of up to $500,000 on indictment (R.S.C. 1985 F.14 (as amended)). Ultimately, the strength of the modified sanctions will depend upon actual fines levied by the courts in the coming years.

4.3 Scientific Research and its Application to Fisheries Management

4.3.1 Fisheries Research in Canada Pre-Extension

Fisheries science as the basis for the management of fisheries is a relatively recent development in the history of science. It had its beginnings in the work of some European investigators at the turn of the century, and in the first two decades of this century, e.g. Peterson and Hjort, but did not really blossom until the interval between the two World Wars. One of the by-products of the First World War was that it demonstrated the impact of fishing on fish stocks. Some Northeast Atlantic stocks which had been intensively fished before the war recovered with the cessation of fishing during the war years. Catch rates and size of fish increased. This provided one of the first practical instances of man's impact on nature through fishing.

Central to the attempts to provide a scientific basis for fisheries management has been the study of fisheries population dynamics. These studies, which proliferated as the century advanced, have provided models which have been used as the basis for the management of fisheries, first in certain international commissions and later by coastal states following the proclamation of 200-mile zones.

Even though Canada had developed a fisheries administration soon after Confederation and passed a Fisheries Act as one of the federal government's first legislative initiatives, there was no scientific investigation on any organized basis until the early 1900s. In 1893, a specialist

in fish embryology, Dr.E.E. Prince, was appointed Canada's commissioner of fisheries. One of Prince's first proposals was to establish a marine scientific station for Canada. Parliament established in 1898 a Board of Management and appropriated $15,000. This represented a turning point for Canadian marine biological research. A station was built which could be transported on a scow from one location to another.

The Board of Management in 1904 also assumed partial responsibility for a freshwater station at Go Home Bay on an island in Georgian Bay, Ontario. In 1908 it decided that a permanent Atlantic Biological Station should be established at St. Andrews, New Brunswick, and that same year a station was established at Nanaimo, British Columbia. In 1912 the Board of Management became the Biological Board of Canada, operating under a special Act of Parliament. It continued to manage the two marine stations but the Georgian Bay Station was abandoned after 1913. The Board's membership was broadened in 1924 to include representatives of the fishing industry and a wider spectrum of academic expertise. At the same time two Technological Stations were established at Halifax, Nova Scotia and Prince Rupert, British Columbia. Over the years other stations and field laboratories were established, moved or abandoned.

In 1937 the name of the Board was changed to the Fisheries Research Board of Canada. This Board continued to manage Canada's fisheries research effort until 1973 when the laboratories and personnel were integrated with the Department of Fisheries, leaving the Board to act in an advisory capacity. By the end of the 1970s it had disappeared in name as well as in fact. The activities of the Fisheries Research Board and its predecessors have been detailed by Ken Johnstone in his entertaining 1977 book "The Aquatic Explorers" (Johnstone, 1977). He drew upon interviews with many of the Board's leading figures to present a colourful, anecdotal

history of the Board. Ricker (1975) summarized the Board's 75 years of achievements in many fields of aquatic science. On both coasts Fisheries Research Board scientists had developed a considerable understanding of the biology and life history of the major commercial species and through advances in population dynamics had laid the groundwork for the more interventionist management regime of the 1970s and 1980s (Ricker, 1975).

4.3.2 Fisheries Research Post-Extension

When Canada extended its fisheries jurisdiction to 200 miles, the federal government's fisheries responsibilities were part of the Department of the Environment, established in 1971. There were two principal components: a Fisheries and Marine Service and an Environmental Service.

A major component of the Canadian response to the 200-mile limit was to strengthen the Canadian capability for fisheries resource assessment research. In order to rebuild the resource, it was recognized that a more sophisticated Canadian capability was required for estimation and prediction of fish stock abundance. The role of resource assessment was now the responsibility of Canada as the coastal state. The failure of many international commissions to manage the fisheries effectively was partly the result of the failure of member countries to devote significant efforts to assessing the resource. Analyses revealed that the level of sampling of the Atlantic offshore commercial fish catch in the mid-1970s was only 40 percent of that required to meet the minimum level of sampling identified by ICNAF's scientific committees (DOE, 1976c). Similarly, the levels of resource survey activity had been inadequate, far less than required to meet the minimum essential levels. The data presented by certain countries were suspect and appeared to have been manipulated by those countries to suit a particular end.

The Task Group on Extended Fisheries Jurisdiction concluded that Canada as the coastal state must develop an independent capability to assess adequately the fish resources off its coasts on a continuing basis without having to rely upon information and/or analyses provided by other countries. To achieve this, it was necessary to increase significantly the levels of scientific activities aimed at assessing the resource potential, monitoring resource fluctuations and predicting trends in resource abundance.

In 1976, considerable scientific effort was directed toward participating in the preparations for an orderly transition to the 200-mile fishing zone in January 1977. This included the analysis of the research that would be required to manage the new zone effectively, the acquisition of the necessary additional funding and putting in place appropriate structures for implementation.

Proposals were made to double commercial catch sampling capability. It was also estimated that 1,500 ship days were required for various kinds of resource survey activity on the Atlantic coast. The Department at that time operated only two research trawlers capable of offshore fishing operations, neither of which was ice-strengthened. Overall, it was calculated that the equivalent of an incremental five vessel years were required; (1) to conduct the required resource inventory surveys; (2) to conduct surveys with specialized gear to determine the abundance of precommercial-age fish for fish species which recruit to the fishery at an early age but the young of which are not taken in regular inventory surveys; (3) to conduct egg and larval surveys to provide a basis for describing the early life history of several major fish species and enable the construction of population models combining early life history stages with adult production and insights on stock recruitment relationships; and (4) to conduct specialized surveys devoted to evaluating and

improving existing survey techniques and research methodology (DOE, 1976c).

A need for laboratory experimentation was also identified. Recent initiatives in multispecies fisheries modelling had produced hypotheses about the nature and functioning of fish population control mechanisms. It was considered necessary to test hypotheses derived from analyses of field observational data through laboratory experimentation under controlled conditions. It was recognized that there are important links between such laboratory studies of the basic mechanisms by which a fish community controls and stabilizes its growth, reproduction and survival, and population dynamics theory as applied by resource assessment scientists.

Additional resource requirements were identified for the processing of samples collected in the field, age determination, and ichthyo-zooplankton, sorting, identification and quantification. All of these additional data would not be of much value unless the results could be analyzed, interpreted and advice provided. It was estimated that about 29 percent of existing scientific and support personnel were involved in analysis, interpretation and provision of advice. Analytical capability required was identified as ranging from data summarization, plotting and updating of standard calculations to innovative development of theory, methodology and analysis of the dynamics and interrelationships of fish stocks. Three main types of analytical activities were distinguished:

1. Distribution, life history and stock discrimination studies;
2. Single species stock assessments;
3. Multispecies fisheries modelling.

Only about half of the TACs imposed by ICNAF were derived from analytical single species stock assessments. The remainder were based on even cruder models or approaches. It

was proposed that the number of scientific person-years devoted to that activity should be doubled.

Even at that time, it was recognized that the existing single species stock assessment approach did not adequately take into account the ecological interaction between species as affected by fishing and the problem of incidental catches in mixed fisheries. The very simple single stock assessment models in use were considered useful for forecasting allowable catches given an early direct estimate of the abundance of recruiting year classes but were not satisfactory for longer term prediction. It was felt that a major thrust in multispecies fishing modelling was required.

By 1979-80 the government had allocated an additional 216 person-years and $23.0 million to conduct the additional research considered necessary (W.G. Doubleday, Ottawa, Personal Communication).

This more than doubled Canadian resource assessment activities in the offshore area. A large proportion of this increase was used to expand Canadian direct-survey capability at sea. This included the long term charter of a 263-foot ice-strengthened offshore trawler, the Gadus Atlantica, capable of conducting research off Newfoundland-Labrador during the winter, and another large stern trawler, the Lady Hammond, capable of bottom and midwater trawling.

4.3.3 New Institutional Structures for the Provision of Scientific Advice

4.3.3.1 Arrangements for Scientific Advice to the International Fisheries Commissions

At the turn of the century the International Council for the Exploration of the Sea (ICES) began to lay the foundations for fisheries science which would later be used as the basis for fisheries management. ICES functioned during its first 37 years as an international scientific forum where fisheries biologists interacted. While scientific advances during the

1930s were considerable, intergovernmental action did not blossom until the Overfishing Convention of 1946 and the subsequent establishment in the Northwest Atlantic of ICNAF in 1951 and in the Northeast Atlantic of the Permanent Commission in 1953, later to become the Northeast Atlantic Fisheries Commission (NEAFC) (Cushing, 1971/72).

The establishment of these commissions, and other international fisheries commissions, for example, in the North Pacific, led to the development of formalized processes for the provision of scientific advice to these management bodies. The processes differed among Commissions. Over time three different mechanisms evolved for the conduct of research and the provision of scientific advice to these international commissions. These three mechanisms were:

(1) The use of an independent research staff as part of the functions of the commission or international fisheries body;

(2) The creation of a committee of scientists drawn primarily from the scientific ranks of member nations; and

(3) The naming of a completely independent group of scientists as the body for the provision of scientific advice.

The first two mechanisms predominated in the North Pacific while the International Whaling Commission with global responsibilities adopted the third approach (Miles *et al*, 1982). In the North Atlantic, ICNAF adopted the second approach while NEAFC used ICES as its advisory body. This latter arrangement could be considered to be a variation of the second and third approaches.

The use of research staff as part of the functions of an international fisheries commission first occurred in the North Pacific in the International Pacific Halibut Commission. This approach was also later used by the International Pacific Salmon Fisheries Commission. Miles *et al* (1982) concluded

that the research operations of the IPHC and the IPSFC were highly successful in providing the scientific basis for management.

When the Canada-USA Pacific Salmon Treaty arrangements were negotiated in 1985, the commission research staff approach was abandoned, indicating that some dissatisfaction had arisen over the years with this approach. The commission research staff approach, to some extent, fosters insular thinking and analyses and does not encourage broad peer review of the advice to management. Such peer review must be an integral element if any scientific advisory process is to be effective.

The second type of arrangement is exemplified in the North Pacific by the International North Pacific Fisheries Commission. The original INPFC Agreement provided that scientific investigations were to be a key function of the Commission. The Commission was composed of national sections representing each member country, with decisions being taken by unanimous vote. The initial major research emphasis was placed on investigating the offshore distribution of salmon, and determining areas of intermingling of salmon of Asian and North American origin. Somewhat later, research effort switched to studies aimed at determining whether particular stocks continued to qualify for abstention under the conditions established in the INPFC Convention. In the later years of the original agreement, the research activities were diversified to include groundfish in the Bering Sea and the Gulf of Alaska. Over the years the Commission also conducted research into oceanographic conditions in the North Pacific that might be related to the extent and variability of intermingling of salmon stocks.

The Commission's main research coordinating mechanism was its Committee on Biology and Research (CBR). This was divided into subcommittees dealing with different aspects of the salmon question, crabs, groundfish, oceanography and research

planning. The CBR emphasized the need, and examined ways of fostering, the coordination of research among the members. These discussions occurred primarily at the time of the annual meetings but sometimes at special meetings called for this purpose. The CBR does not seem to have evolved into a specific mechanism for the provision of scientific advice on management, to the extent witnessed in the North Atlantic during the 1960s, 1970s and 1980s.

Since 1967, Canada has also been a member of ICES. Although ICES on the surface appears to provide a forum for the coordination and promotion of scientific research throughout the North Atlantic, it is primarily a regional organization whose principal focus is on the Northeast Atlantic, particularly the North Sea and the Baltic.

With the proliferation of requests for advice on management, ICES developed in 1978 a more formal structure for dealing with stock assessments and providing advice on management, the Advisory Committee on Fisheries Management (ACFM). On behalf of the Council, ACFM provides advice on fisheries management directly to member governments and the EEC on request, to the International Baltic Sea Fisheries Commission (IBSFC), and to the North Atlantic Salmon Conservation Organization (NASCO). These commissions formally recognize ICES as a statutory advisory body and contribute to its funding.

ACFM has been in existence for approximately 15 years and has developed standardized procedures for the provision of advice. The nature of the advice provided by ACFM and the relative success of management of the Northeast Atlantic stocks are addressed by Parsons (In Press).

Canada participates in ICES and in ACFM. Its main interest has been in ICES as a forum for discussions of advances in the methodology and techniques of fisheries science. The only scientific advice that ICES provides for stocks of Canadian interest is as the scientific advisory body

for NASCO. Occasionally, Canada has referred special questions to ICES for advice, e.g. the status of harp seals in the Northwest Atlantic in the 1970s at a time when the EEC was first placed under internal pressure to impose an import ban on the pelts of whitecoats.

The primary international commissions of interest to Canada in the Northwest Atlantic have been ICNAF and the Northwest Atlantic Fisheries Organization (NAFO). Although Article VI of the Convention for the Northwest Atlantic Fisheries (1949) empowered the Commission to conduct independent scientific investigations, its scientific investigations were conducted through the agencies of Contracting Governments. Representatives of those scientific agencies met in committees established by ICNAF to plan such research, report on findings and generate advice to the Commission.

The chief scientific committee of ICNAF was known as the Standing Committee on Research and Statistics (STACRES). STACRES became very active throughout the life of ICNAF in developing a system for collecting statistics on the fisheries of the Northwest Atlantic, in reviewing and planning coordinated research programs, and, particularly during the last decade of ICNAF's existence, in the generation and provision of scientific advice on management.

It brought together respected fisheries scientists from many countries, including coastal states such as Canada and the United States and distant water fishing countries from the Eastern European Bloc and Western Europe. STACRES was chaired at various times by individuals who became well known in fisheries circles, for example, Wilfred Templeman, John Gulland, Basil Parrish, Arthur May.

During the period when catch quotas became the primary management tool (the early 1970s), most of the supporting analyses were carried out in the Assessments Subcommittee of STACRES, which was chaired by individuals such as Garrod from

the UK, Hennemuth from the USA and Pinhorn from Canada. This committee functioned by a process of peer review. Underlying data and assumptions were examined and challenged, and the advice given to the Commission was the best available scientific opinion at that time, using "state of the art" stock assessment methodologies as they then existed. While the scientists were there as representatives of their governments and national interest was sometimes evident in the discussions, for the most part scientific integrity dominated and the advice offered was largely free of national bias. The distant water nations had sufficient fishing interests in the Northwest Atlantic up to the mid-1970s, to motivate them to send their best fisheries scientists to participate in the deliberations of STACRES and to act as advisers to national delegations during the Commission meetings. The scientific debate was of high calibre (A. Pinhorn, St. John's, Personal Communication).

The management measures taken by ICNAF were too little too late. This was more the fault of the limited data available and the models in use, combined with the gradual adaptation to a TAC regime and lack of adequate international enforcement, than of scientific intransigence. In fact, STACRES was leading the Commission to adopt progressively more stringent conservation regulations, prodded by scientists from Canada and the United States.

With the extension of fisheries jurisdiction to 200 miles it became necessary to negotiate a new international management regime for stocks beyond 200 miles and stocks straddling the 200-mile limit. This led to the formation of the Northwest Atlantic Fisheries Organization in 1979. Canadian representatives involved in the negotiation of the successor organization to ICNAF considered briefly the idea of using ICES as the scientific advisory body. This option was rejected because it was felt that ICES was preoccupied with

Northeast Atlantic matters and dominated by scientists whose countries were distant water states in the Northwest Atlantic.

The design of NAFO was complicated by Canada's desire that the new scientific advisory body be able to provide scientific advice, on request, to the coastal states and not just to the new Fisheries Commission responsible for the management of stocks beyond 200 miles. These considerations stimulated the creation of a three-headed beast, the Northwest Atlantic Fisheries Organization (NAFO), which is comprised of two separate bodies, the Fisheries Commission and the Scientific Council, with the administrative activities of these two bodies being coordinated by a General Council (see Chapter VI, section 4.1).

Articles VI-VIII of the 1978 International Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries deal with the mandate and functioning of the Scientific Council (NAFO, 1984). The net effect of these Convention provisions is that, with respect to the Fisheries Commission, the Scientific Council functions much as STACRES did in ICNAF, providing advice on request. The difference is that, unlike STACRES, it is equal in status but with different functions. The relationship of the Council to coastal States is more complex. The Council shall provide advice to a coastal State only on request and within the terms of reference stipulated by the coastal State.

Initially, the Scientific Council functioned relatively smoothly providing advice on the stocks managed by the Fisheries Commission, usually in terms of the F_{01} catch, in accordance with the procedures established during the last days of ICNAF. Canada, as a coastal State, requested advice from the Scientific Council on those stocks within its 200 mile zone which involved a significant foreign fishery for quantities surplus to Canadian requirements, e.g. silver hake, roundnose grenadier, Greenland halibut.

The relatively harmonious functioning of the NAFO Scientific Council was shattered at the 1985 Annual Meeting of the Fisheries Commission when the EEC demanded advice for a wide range of fishing mortality options and wanted northern cod to be considered by the Scientific Council (see Chapter VI, section 4.1). The latter demand was successfully resisted by Canada. However, thereafter relations within the Scientific Council degenerated. The polarization between Canada and the EEC in the Fisheries Commission spilled over into the Scientific Council, even to the point where the EEC representative demanded voting on the scientific advice as well as procedural matters. There were attempts to stimulate the Scientific Council to provide, on its own initiative, advice on matters for which the Fisheries Commission had explicitly chosen not to request advice.

Another significant factor which impacted negatively on the effectiveness of the Council was the diminished participation by certain countries in the Council's deliberations. Compared with the last days of STACRES, the quantity and quality of representation from non-coastal States decreased. The distant water fishing countries had significantly diminished access to fish allocations in the Northwest Atlantic (see next chapter) and consequently little incentive to send their best fisheries scientists to NAFO Scientific Council meetings. Instead, their attention turned to fisheries assessment issues within ACFM and its working groups. This meant that the NAFO Scientific Council failed to live up to the expectations of the drafters of the Convention. It continues to provide advice to the Fisheries Commission and to coastal States but is not the vigorous forum for the discussion and advancement of fisheries science that was originally envisaged.

4.3.3.2 The Evolution of New Domestic Mechanisms for the Provision of Scientific Advice

For the domestic fisheries in the pre-extension era advice to managers was generally provided on an individual scientist basis. Peer review had become accepted as a necessary operating procedure in the international fora but the advisory mechanisms were much more fluid for those coastal fisheries under Canadian management. Scientific advice on the management of particular fisheries could often pass directly from an individual scientist to fisheries managers without being subjected to an internal peer review process. This meant that the quality and nature of the advice was dependent on the idiosyncrasies of individuals. There was no assurance that the scientific methodology being applied was the best available at that time. There was no formal structure in place to ensure peer review of the analyses and advice offered. Individual scientists would often seek the advice of colleagues but there was no requirement to do so. Yet, if a scientist wished to publish a paper in a refereed journal, he had to submit to peer review.

This situation became untenable as Canada moved to extend its fisheries jurisdiction over the major fish stocks of the continental shelf. New mechanisms were required to generate and provide scientific advice on the management of fisheries in the extended zone. For fisheries beyond 200 miles international scientific advisory bodies would continue to provide advice. Within 200 miles new approaches were required.

4.3.3.2.1 Canadian Atlantic Fisheries Scientific Advisory Committee

A formal mechanism was required for the regular provision of scientific advice on all fisheries management matters on the Atlantic coast. In the year prior to extension of fisheries jurisdiction, the Canadian Atlantic scientific

community took action to ensure that a suitable mechanism was put in place. To this end, it proposed that a scientific advisory body be established immediately (A. Pinhorn, St. John's, Personal Communication). It was envisaged that the new committee would function along the lines of STACRES.

A new Canadian Atlantic Fisheries Scientific Advisory Committee (CAFSAC) commenced operations on January 1, 1977. The inaugural meeting of the Steering Committee for CAFSAC was held in January of 1977 (CAFSAC, 1978).

Under its Terms of Reference, CAFSAC is responsible for providing scientific advice to the Atlantic Fisheries Management Committee on the management, including the full range of conservation measures taking into account economic objectives, of all stocks of interest or potential interest to Atlantic coast fishermen. This advice is to be provided in accordance with specific fisheries management objectives and strategies and is published as a matter of routine (CAFSAC, 1978).

The Steering Committee of CAFSAC was comprised of the Directors of Resource Branches in the Maritimes, Newfoundland and Quebec regions, i.e. the regional fisheries research directors under the existing organization, the Director of the Fisheries Research Branch in Ottawa, chairmen of the Subcommittees and a few appointed expert members. The Steering Committee became the focal point of CAFSAC although the actual stock assessment work is done by scientists in various Subcommittees. It reviews the Subcommittee reports to ensure all relevant information is submitted to senior management for consideration. It was also "vested with the responsibility for identifying weak areas in the scientific data base and methodology used by the Subcommittee to reach conclusions." Scientific advice is submitted to senior fisheries managers in the form of Advisory Documents.

The initial Chairman's Report, contained in the first Annual Report of CAFSAC, gave the context in which CAFSAC was

established, its modus operandi and suggested areas of future activity. The Chairman observed:

> "The key to the present and the future success of CAFSAC is that it functions as a peer group. On scientific matters, the collective judgement of the group takes precedence over individual scientist's considerations....
>
> "- peer review - All assessments and analyses are reviewed in detail by other specialists and new methods, if more appropriate, are made readily available for re-analyses of data.
>
> "- collective responsibility - Biological advice on each stock is prepared by a group of specialists who have examined the analysis, re-analysed it, tried new methods and made a judgement concerning adequacy of the data and the analysis. Group responsibility does not make the individual less responsible. It does increase the overall competence of all assessment work, ensures a uniformity of methodology and encourages new methods to be tried. Above all else, it ensures a high degree of scientific objectivity which is mandatory in the business of providing scientific advice.
>
> "- documentation - The basic theory of fisheries science is reasonably old, but much of it remains untested theory or special cases developed for a particular species. Considerable effort is made by Canadian scientists to develop new methods of analysis and to bring new dimensions to the theory under the demanding tests of practical application. Careful documentation is essential for future reference and to facilitate incorporation of new information." (CAFSAC, 1978)

These three pillars - peer review, collective responsibility and documentation - have continued to be the operating philosophy of CAFSAC throughout its existence.

Over the next several years CAFSAC settled into the routine provision of advice on the setting of Total Allowable

Catches and other management measures for all of the major fish and invertebrate stocks within the Canadian fisheries zone on the Atlantic. By its fifth year of operation, its activities had grown to the extent that it was decided that a full-time chairman was required. The demands on the time of Subcommittee chairpersons and members also increased significantly. Each year CAFSAC produced a steady flow of Advisory Documents on the management of particular species and stocks which were discussed in the appropriate fisheries management advisory committee and formed the scientific basis for whatever management measures were implemented. For the groundfish stocks the advice was generally offered in terms of the F_{01} catch. The implications of alternative management options were provided on request.

4.3.3.2.2 Pacific Stock Assessment Review Process

The research effort on the Pacific coast was more diffuse and uncoordinated. Ever since the introduction of herring quotas in the 1940s, there had been informal mechanisms for the provision of scientific advice for management. The Pacific salmon fishery tended to be managed on a species by species, stock by stock, gear type basis, with in-season estimates of the size of the returning spawning runs. Estimates of required escapement were based on scientific models developed by Ricker and others (Ricker, 1958). Fishing was permitted each year for the surplus above the required spawning escapement. Fisheries on mixed stocks during migration complicated the picture.

The Committee on Biology and Research of INPFC provided a forum to discuss the problem of high seas interceptions of salmon. The IPHC staff provided advice on the management of the halibut stocks. Prior to extension of jurisdiction the groundfish fishery on the Pacific coast (with the exception of halibut) was of minor significance.

Because of the narrow continental shelf off Canada's Pacific coast, the need for a formal scientific advisory structure like CAFSAC was not immediately recognized. This was compounded by rivalries existing among the various applied research groups operating within the Pacific region. The biologists of the former Resource Development Branch and the Fisheries Research Board had not been successfully integrated into one scientific research arm of the Department during the pre-extension period from 1973 to 1976.

Following the first five successful years of CAFSAC, senior fisheries research managers in Ottawa began to promote the idea of a CAFSAC-type mechanism for the stocks of the Pacific coast. In August, 1983, a proposal was made for a Pacific Region Scientific Advisory Committee based on the CAFSAC model. In February, 1985, the Regional Director General announced the implementation of a stock assessment review process. The first series of reviews of groundfish, herring and shellfish stock assessments took place in the fall of 1985. There was no examination of salmon assessments in that year. The advice emerging from those reviews was summarized in memorandum form and provided only internally to Branch Directors within the Pacific Region (Stocker, 1987).

In 1986, with the establishment of an integrated Science Sector nationally within DFO, attention focused on the need to create a formal Pacific stock assessment peer review process. A 1986 Review of Pacific and Freshwater Fisheries Science noted that the review process initiated in 1985 was "up and running" only for herring, groundfish and some shellfish. The Review observed that "stock assessment work for salmon is still diffuse and much effort is required to develop a PSARC model for this species group." (DFO, 1986a)

During 1986 Dr. Max Stocker was appointed as Chairman and instructed to develop PSARC formally, with the aim of improving stock assessment methodology and capability in the region with special emphasis on salmon. In 1986, PSARC again

reviewed groundfish, herring and shellfish stock assessments. In addition, three salmon programs were also reviewed: Chinook "key stream" program, Coho stock assessment, and Barkley Sound Sockeye. The first five formal advisory documents resulting from these reviews are contained in the Pacific Stock Assessment Review Committee Annual Report for 1986 (Stocker, 1987).

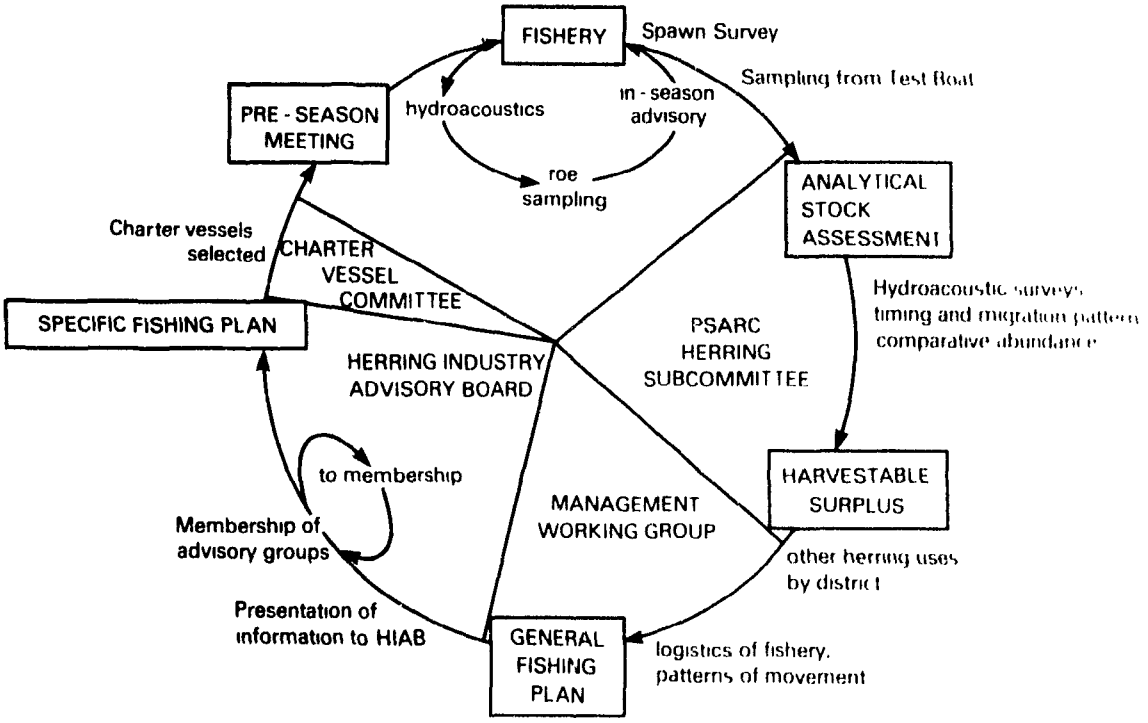
As a result of discussions between the Assistant Deputy Minister, Science and the Regional Director General, PSARC was formally launched in 1987, a decade after extended jurisdiction. PSARC was constituted as a Committee to review biological advice on the status and management of Pacific fisheries resources. PSARC reviews methodologies and criteria employed in the stock assessment process. Broadly speaking, PSARC encompasses the stock assessment community of DFO in the Pacific Region responsible for providing biological advice to senior management in the Region. PSARC is administered by a Steering Committee, with a Chairman who reports to the Regional Director General. The technical work of PSARC is performed by subcommittees, organized on a species or subject basis.

To a large extent, PSARC was constructed along the lines of the CAFSAC model. There was one exception, namely, the inclusion of some representatives from the Fisheries Operations Branches. Given the dispersion of applied research within the Pacific Region this was a necessary feature of the PSARC structure.

There are considerable differences in the way the Pacific stock assessment review process functions for species such as herring and salmon. Perhaps one of the best examples of how PSARC has been integrated into the fisheries management process is the case of Pacific herring (Stocker, In Press). (Figure 4-3).

Fig. 4.3 Management process for Pacific Herring.

Source: Stocker, M. (In Press)


FISHERY
Spawn Survey
Sampling from Test Boat
PRE - SEASON MEETING
hydroacoustics
in - season advisory
roe sampling
ANALYTICAL STOCK ASSESSMENT
Charter vessels selected
CHARTER VESSEL COMMITTEE
SPECIFIC FISHING PLAN
Hydroacoustic surveys
timing and migration pattern
comparative abundance
PSARC HERRING SUBCOMMITTEE
HERRING INDUSTRY ADVISORY BOARD
to membership
HARVESTABLE SURPLUS
MANAGEMENT WORKING GROUP
Membership of advisory groups
other herring uses by district
Presentation of information to HIAB
GENERAL FISHING PLAN
logistics of fishery, patterns of movement

The scientific advisory process for salmon is more diffuse, with the Salmon Stock Assessment Subcommittee of PSARC providing only a macro overview of trends and focusing on certain key stocks and issues. The process for the input of biological advice into in-season management of the Pacific salmon fisheries is quite different in nature from the formalized CAFSAC pre-season process used for Atlantic groundfish, for example, or even the mixed system used for Pacific herring. It lacks the peer review dimension but does have an element of collective responsibility. The decision-making process is subjective rather than analytical (Sprout and Kadowaki, 1987).

A peer review scientific advisory process is used for Pacific salmon on a bilateral basis in the various scientific committees established to provide advice to the Canada-USA Pacific Salmon Fisheries Commission. Article II.17 of the Pacific Salmon Treaty provided for the establishment of a Standing Committee on Research and Statistics. This Committee serves many of the same functions as STACRES in ICNAF or the NAFO Scientific Council but on a bilateral rather than a multilateral basis. The difficult bilateral management issues involved ensure vigorous scientific review and debate of all analyses brought forward for the Commission's consideration.

4.4 New Arrangements for Managing Canada's Domestic Fisheries

4.4.1 The Legislative Basis

Under Section 91(12) of the Constitution Act, 1867, the federal government has authority over fish in the water until it becomes private property, the provinces have jurisdiction over land-based activities such as fish processing, and the federal government has authority over interprovincial trade and export. From this latter provision, it also derives the right to set fish inspection standards and, with the

cooperation of the provinces, has developed a nationwide fish inspection system.

This federal mandate to manage Canada's fisheries has been exercised primarily through two statutes - the Fisheries Act, which is the primary source of authority for managing domestic fisheries, and the Coastal Fisheries Protection Act, which is the primary source of authority for managing foreign fisheries under Canada's jurisdiction within its 200 mile fisheries zone.

The Fisheries Act, apart from some specific antiquated provisions dating back to the previous century (rescinded in 1991), allows the federal Minister responsible for fisheries and the Governor General in Council considerable discretion to regulate the fisheries and to change rules and regulations without further reference to Parliament. One of the most powerful sections of the Fisheries Act is Section 7 which allows the Minister to issue fishing leases and licenses "in his absolute discretion". Section 43 (m) of the Fisheries Act grants the Governor General in Council discretion to regulate:

(a) the proper management of seacoast and inland fisheries;
(b) the conservation and protection of fish;
(c) the catching, loading, landing, handling, transporting, and disposing of fish;
(d) the operation of fishing vessels;
(e) the use of fishing gear and equipment;
(f) the issuing and cancelling of fishing licenses and leases;
(g) the conditions of licenses or leases;
(h) the obstruction of pollution of any waters frequented by fish;
(i) the conservation of spawning grounds;
(j) the export of fish;
(k) the interprovincial transport or trade of fish;
(l) the duties of federal employees; and

(m) the delegation to federal officials administration of the authority to vary any close time or fishing quota.

Similarly, the Coastal Fisheries Protection Act authorizes the Governor General in Council to establish the conditions under which foreign fishing vessels may fish in Canadian waters and authorizes protection officers to board and search foreign fishing vessels in Canadian waters.

Although there are other Acts pertaining to fisheries, these two Acts provide the basic underpinning of the Ca· 'ian fisheries management system. The widespread discretionary powers under these Acts permit the federal Minister and the federal Cabinet to put in place a flexible fisheries management system and to modify it almost at will. Fisheries policies, as such, are not contained in these Acts. These statutes are generally silent on the direction of fisheries policy and leave a wide latitude as to how it is to be implemented.

4.4.2 The Organizational Structure of Canadian Fisheries Management

The organization of fisheries management in Canada has gone through numerous statutory changes since 1867. These are summarized in Table 4-1. From 1867 to 1884, the fisheries bureaucracy constituted the Fisheries Branch of the Department of Marine and Fisheries. From 1884 to 1892, there was a separate Department of Fisheries. From 1892 to 1914, the organization reverted to the former structure of the Fisheries Branch, Department of Marine and Fisheries. From 1914 to 1920, the Fisheries Branch was located in the Naval Services Department. From 1920 to 1930, the Fisheries Branch was again part of a Department of Marine and Fisheries. In 1930, the Department of Marine and Fisheries, which had been the dominant structure since Confederation with two brief changes,

Table 4.1 The organizational management of fisheries in Canada - 1867 to the present

1867 - 1884	Marine and Fisheries - Fisheries Branch
1884 - 1892	Department of Fisheries
1892 - 1914	Marine and Fisheries - Fisheries Branch
1914 - 1920	Naval Services - Fisheries Branch
1920 - 1930	Marine and Fisheries - Fisheries Branch
1930 - 1969	Department of Fisheries
1969 - 1971	Department of Fisheries and Forestry
1971 - 1976	Environment - Fisheries and Marine Service
1976 - 1979	Fisheries and the Environment - Fisheries and Marine Service
1979 -	Fisheries and Oceans

Source: DFO Factbook 1989

became the Department of Fisheries. The Department of Fisheries existed until 1969 when the Department's mandate was broadened to encompass forestry in a new Department of Fisheries and Forestry.

In 1971, the management of fisheries was subsumed in a Fisheries and Marine Service component of a new multi-faceted Department of the Environment. This occurred as a result of growing concern about the need for environmental protection at the beginning of the 1970s. From 1971 to 1974 the Minister of the Environment, Jack Davis, was also the Minister responsible for fisheries. The fisheries constituency in Canada was very dissatisfied with this state of affairs and lobbied for the restoration of a full-fledged fisheries department. Following the departure of Jack Davis, and the appointment of Jeanne Sauvé as Minister of the Environment, Roméo LeBlanc was appointed as the Minister of State of Fisheries in 1974, as a junior minister under the Minister of the Environment. In 1976 the Department's name was changed to Fisheries and the Environment and Roméo LeBlanc was appointed Minister of Fisheries and the Environment.

In 1979, partly in response to the expanded responsibilities for fisheries generated by the 200-mile zone, Parliament split the Department of Fisheries and the Environment into two departments - a new Department of Fisheries and Oceans, and a Department of the Environment. After many changes, a single Minister again spoke with authority on fisheries (and oceans) issues.

From 1979 to 1986 the Department of Fisheries and Oceans consisted of four primary organizational components, each headed by an Assistant Deputy Minister: Atlantic Fisheries, Pacific and Freshwater Fisheries, Economic Development and Marketing, and Ocean Science and Surveys. Under this organizational set-up, the Atlantic Fisheries Service was responsible for fisheries management in the four Atlantic provinces and Quebec. After 1981, there were four regional

fisheries offices (Newfoundland, Scotia-Fundy Gulf and Quebec Regions), headed by Directors General of Fisheries Management. The Newfoundland Region was responsible for the management of fisheries along the south and east coasts of Newfoundland and in Labrador. The Scotia-Fundy Region was responsible for fisheries on Georges Bank, in the Bay of Fundy and on the Scotian Shelf. The Gulf and Quebec Regions shared responsibility for the management of fisheries in the Gulf of St. Lawrence.

Under the ADM, Pacific and Freshwater Fisheries, who was responsible for federal fisheries matters in central and western Canada and the Arctic, there were three Regions, an Ontario Region, a Western Region (the Prairie Provinces and the Northwest Territories) and the Pacific Region (British Columbia and the Yukon). Ocean Science and Surveys, responsible for oceanographic and hydrographic programs, had four regional science centres headed also by Directors General: the Bedford Institute of Oceanography in Dartmouth, Nova Scotia, the Champlain Centre for Marine Science and Surveys in Quebec City, the Bayfield Laboratory in Burlington, Ontario, and the Institute of Ocean Sciences at Sydney, British Columbia. Altogether there were eleven regional Directors General within the Department of Fisheries and Oceans, whose geographic, but not functional, mandates overlapped.

In 1986, the organizational structure of DFO underwent major changes. In February 1986, Minister Siddon announced that the regional operations of the Department would be consolidated into six regions, by combining the seven fisheries and four ocean science and surveys regions. The headquarters staff of the department was reduced by 23 percent. The fisheries research components of the former Atlantic Fisheries and Pacific and Freshwater Fisheries Services were merged with the oceanographic and hydrographic programs of the former Ocean Science and Surveys to form a new

integrated science sector, headed by a new Assistant Deputy Minister for Science (DFO, 1986b).

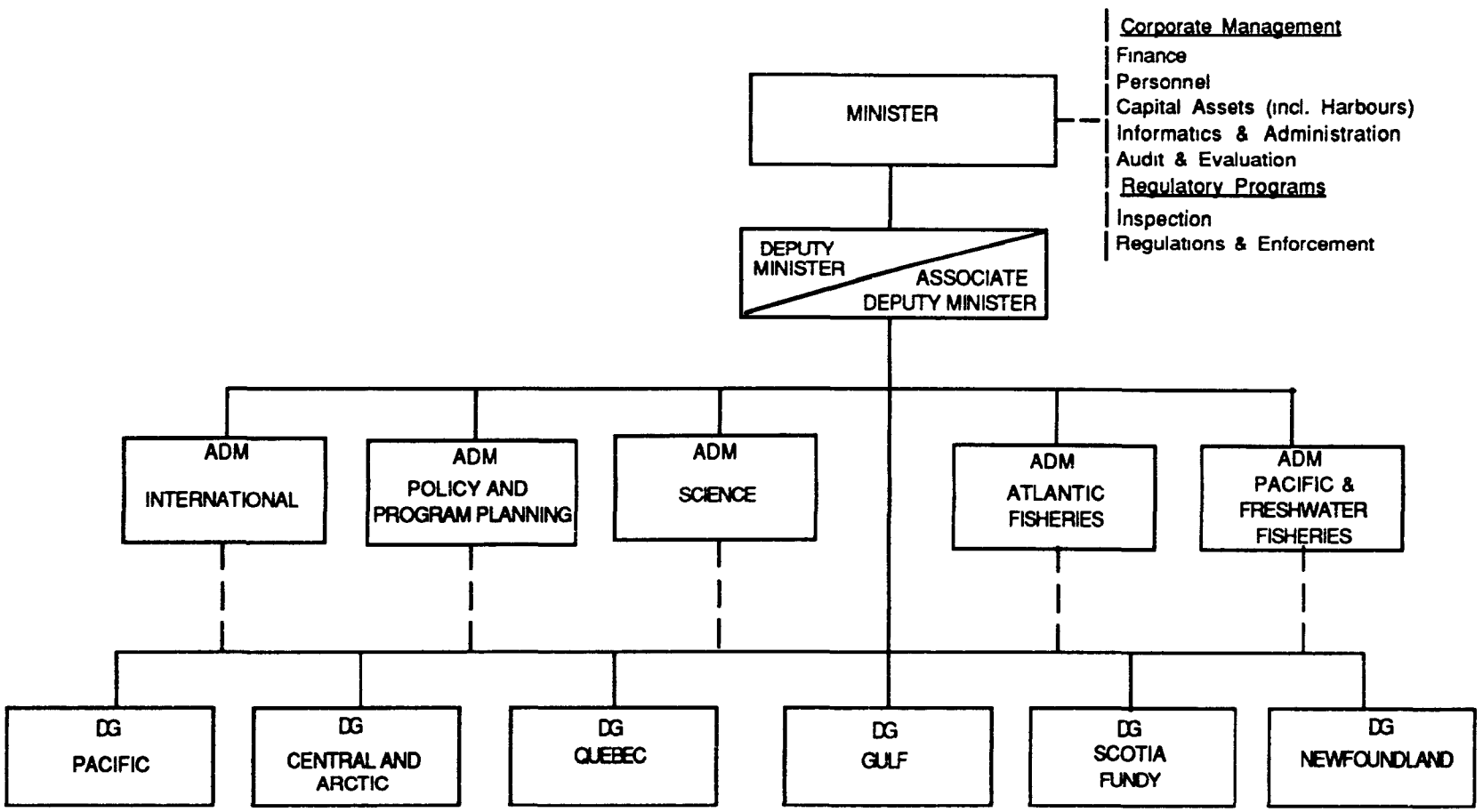
These decisions were elaborated upon in a September 1986 announcement (DFO, 1986c). The new Regional Directors General were to manage all of the Department's operations within the six new geographic regions: Newfoundland, Scotia-Fundy Gulf, Quebec, Central and Arctic, and Pacific. They would report directly to the Deputy Minister but were also accountable to the Sector ADMs, Atlantic Fisheries, Pacific and Freshwater Fisheries and Science for the delivery of sector programs in their regions. The resulting organization is shown in Figure 4-4.

Day-to-day fishery management issues tend to be handled through mechanisms such as the Atlantic Directors General Committee, chaired since 1978 by the Assistant Deputy Minister, Atlantic Fisheries, which has been in existence since the early 1970s and has survived several reorganizations. It has both regional and headquarters representation and plays a key role in the annual development of "fishing plans" and the development of Atlantic-specific fisheries policies. Ultimately, however, decision-making authority is vested in the Minister of Fisheries and Oceans. As the Department became more heavily involved in fisheries regulation during the 1970s and 1980s, there was an increasing tendency for the Minister to become involved not just in shaping the policy direction of the Department but also in micro-level decision-making on politically sensitive operational issues. On the one hand, the departmental bureaucracy is heavily decentralized with more than 90 percent of the department's staff located outside Ottawa. On the other hand, because the Minister is seen as accountable for every fisheries management decision big or small, a major component of the decision-making has been centralized, with the Minister and his staff taking most key decisions, taking into account the advice of the senior bureaucrats channelled

Fig. 4.4 Organization chart for the Department of Fisheries and Oceans resulting from the September 1986 reorganization

Source: DFO 1986. Detailed summary of the organizational and staff changes at Fisheries and Oceans Headquarters. Fisheries and Oceans, Backgrounder. September, 1986.

DEPARTMENT OF FISHERIES AND OCEANS



through the ADMs and the Deputy Minister. This has occurred in spite of the increasing complexity of the fisheries management system, particularly since the extension of fisheries jurisdiction.

4.4.3 Evolution of Consultative/Management Processes

DFO and the Minister do not make these decisions in a vacuum. The Department has to respond to a multitude of "publics" including formal and informal groups of stake-holders, and conflicting values bombarding the Department from commercial, recreational and native fisheries representatives, provincial governments, foreign governments and international agencies, to cite just a few. Unlike many departments, DFO cannot ignore the claims and counterclaims of fishermen, processors, provincial governments and other interest groups. Because it is allocating the opportunity for wealth and the right to earn a livelihood from fishing, it has to reconcile conflicting interests. The Minister, in particular, under the existing institutional arrangement is faced with the difficult task of rendering decisions which are perceived as fair and reasonable by that vast multitude of interested parties. Given the wide diversity of those interests, the challenge has been to design structures which allow for meaningful input from all groups with a stake in how the fishery is managed, while at the same time avoiding policy paralysis.

Policies for the management of Canada's Atlantic fisheries evolved rapidly during the 1970s and 1980s. Management and consultative processes developed at a similar pace. As policies changed, consultative and decision-making structures also changed.

Prior to 1971, the main emphasis in fisheries policy was on the development and expansion of Canada's capability to harvest and process offshore fish resources in competition with foreigners. The only structured consultative mechanism was the Federal/Provincial Atlantic Fisheries Committee

(FPAFC) of Deputy Ministers. This was established originally to coordinate federal and provincial efforts to "modernize" the fleets. There was no formal domestic consultative framework to feed industry and provincial views into fisheries management decisions. Policy and management decisions were taken by the Minister on the advice of the department. This advice was largely focused on conservation and protection activities within Canada's narrow fisheries waters.

During the period from 1972 to 1976 there was a dramatic shift in the approach to management. ICNAF adopted the approach of setting TACs and national quotas and Canada took its first steps toward limited entry. New consultative mechanisms were established in the form of fisheries advisory committees (species specific). These consisted of federal, provincial and industry representatives. Examples included the Offshore Groundfish Advisory Committee (OGAC), and Atlantic Herring Management Committee (AHMC). Because of declining stock abundance during that period, these committees focused primarily on stock management issues rather than on resource allocation or industry viability. Inshore fishermen were generally unorganized, resulting in an ineffective input from that sector into the decision-making process.

Fish processors, on the other hand, were well represented by the Fisheries Council of Canada (FCC) which was generally able to gain the ear of the Fisheries Minister and was quite influential in shaping fisheries policy. Also during this period there was extensive consultation on international fisheries issues.

The post-extension period from 1977 to 1981 saw the proliferation of consultative committees, as government assumed a more interventionist regulatory role with the proclamation of the 200-mile fisheries zone. Major stocks were declining. The TAC controls introduced by ICNAF had proven ineffective and Canadians were forced to tighten their belts. In 1977, the first Atlantic Groundfish Fishing Plan

was introduced to share among the fleets an insufficient supply of fish. With the introduction of resource allocation and the more widespread adoption of entry controls, the clash of conflicting interests became apparent. So, too, did the need for structured consultative processes. OGAC evolved into AGAC, the Atlantic Groundfish Advisory Committee, which became a major forum for the discussion of stock management and resource allocation issues.

During the 1977 to 1981 period, controls were introduced and strengthened to foster the rebuilding of depleted stocks. At the same time emphasis was placed on establishing foreign and domestic quotas and establishing necessary monitoring and enforcement systems. The consultative process began to focus on the contentious question of allocating the available resource among fleet sectors and achieving a balanced input by all participants to allocation decisions. The fisheries consultative committee system expanded. So did the federal government's attempts to deliver services at the local level. Decentralization of the delivery of services occurred with the establishment of the Area Manager system. Policy decisions, however, remained centralized. While large companies and the processing sector in general were organized to provide significant input into influencing policy decisions, the inshore sector had still not acquired the analytic and communication capabilities to represent effectively the views of its members, with certain notable exceptions e.g. the Newfoundland Fishermen, Food and Allied Workers Union (NFFAWU). During this period the Minister of Fisheries, Roméo LeBlanc, encouraged fishermen to organize so that their voice could be heard in the corridors of power. The Department assisted fishermen's groups to organize.

From 1981 to 1985 the Department attempted to strengthen the consultative mechanisms to provide for regular annual consultations on TACs, allocations and regulations for all fisheries. In addition to the established

advisory/consultative committees, the Department convened special policy seminars or individual consultations which focused on the longer term strategies for certain fisheries (e.g. northern cod, Atlantic herring) or addressed particular policy issues (e.g. quality improvement). Representation was drawn from all sectors of the industry as well as the provinces. As well, there were annual series of meetings with industry representatives which focused on strategies/positions to be taken in annual bilateral discussions with foreign countries which fish in Canadian waters.

The Federal-Provincial Atlantic Fisheries Committee continued to meet on a regular basis to discuss not only resource management questions but an array of fisheries policy issues of mutual concern to both levels of government. The FPAFC also served to coordinate programs between the two levels of government. The Atlantic Council of Fisheries Ministers (ACFM), established in 1978, met several times a year to discuss resource management and fisheries policy issues.

In 1985, another consultative body, the Atlantic Regional Council (ARC), was added to the consultative structure. It was followed some time later by the establishment of a somewhat similar Pacific Regional Council (PARC).

The structure of consultative/advisory committees evolved differently in different regions, influenced by differences in the fisheries and the structure of fishermen and processors' organizations.

By the late 1980s there were eight multi-regional species advisory committees on the Atlantic Coast. The largest and most-well known of these is the Atlantic Groundfish Advisory Committee (AGAC) which has regional and sub-regional committees. The Atlantic Salmon Board, representing the recreational, commercial and native user groups, as well as the provinces is another major multi-regional species consultative committee. Other species-based consultative

committees dealt with seals and sealing, whales, northern shrimp, squid and bluefin tuna. In addition to these coast-wide committees, Quebec and the Gulf Regions, which share fisheries management responsibilities in the Gulf of St. Lawrence, have five species-oriented joint committees. At the regional level, there is a plethora of regional and sub-regional licence appeal committees plus a large number of species-oriented committees.

The terms of reference for these committees focus primarily upon the question of TACs or alternative management measures, allocations and regulations which are expressed in the form of an annual fishing plan. Scientific advice from the Canadian Atlantic Fisheries Scientific Advisory Committee is channelled to the Assistant Deputy Ministers of Atlantic Fisheries and Science. From there this advice proceeds to:

(a) an inter-regional management advisory committee for inter-regional consultations and development of a draft management plan;

(b) in the case of stocks of concern to one region only, the advice proceeds to the appropriate single region advisory committee for consultation and development of a plan;

(c) draft management plans are forwarded to the Atlantic Directors General Committee where key recommendations on strategies and TACs are formulated;

(d) the Directors General Committee refers recommendations to the Minister, via the ADM, Atlantic Fisheries, and the Deputy Minister, for approval. The Deputy Minister consults with hi provincial colleagues through the mechanism of FPAFC and the Minister with his provincial colleagues through the mechanism of the Atlantic Council of Fisheries Ministers; and

(e) following the Minister's decision, or the decision of cabinet in exceptional cases, regulations are drafted, finalized and promulgated and the fishing plan announced.

For stocks managed by the Northwest Atlantic Fisheries Organization (NAFO), advice proceeds from the NAFO Scientific Council to the NAFO Fisheries Commission. The advice is also reviewed by the Atlantic Directors General Committee which employs this advice for consultation with inter-regional advisory committees regarding the Canadian negotiating position, including the estimation of Canada's harvesting requirements. Following NAFO decisions on TACs and allocations, inter-regional advisory committees are consulted regarding development of a Canadian management plan, following the process described in (a) above.

This process for the Atlantic groundfish fishery is summarized in Figures 4-5 and 4-6.

The process of evolution of consultative arrangements on the Pacific coast is less clear. Over time the fisheries consultative processes have changed significantly as the complexity of management has increased. As late as the mid 1970s, much of the public advisory process was informal, occurring between ad hoc groups or individual users and fisheries staff, especially fishery officers in the field.

By the late 1970s a formal consultative structure had evolved. In 1982 this consisted of 12 advisory groups ranging from specific river-based advisory committees to an Advisory Council to the Minister known during the mid 1980s as the Ministers Advisory Council (MAC).

The fishing industry at this time was also involved as advisors to the Canadian delegations to three international commissions, the INPFC, the IPHC and the International Pacific Salmon Fisheries Commissions.

The stated purpose of these various advisory groups was to ensure "industry's participation in important decisions

Fig. 4.5 Atlantic groundfish management process.

Source: Atlantic Operations Directorate, Department of Fisheries and Oceans, Ottawa

ATLANTIC GROUNDFISH MANAGEMENT PROCESS

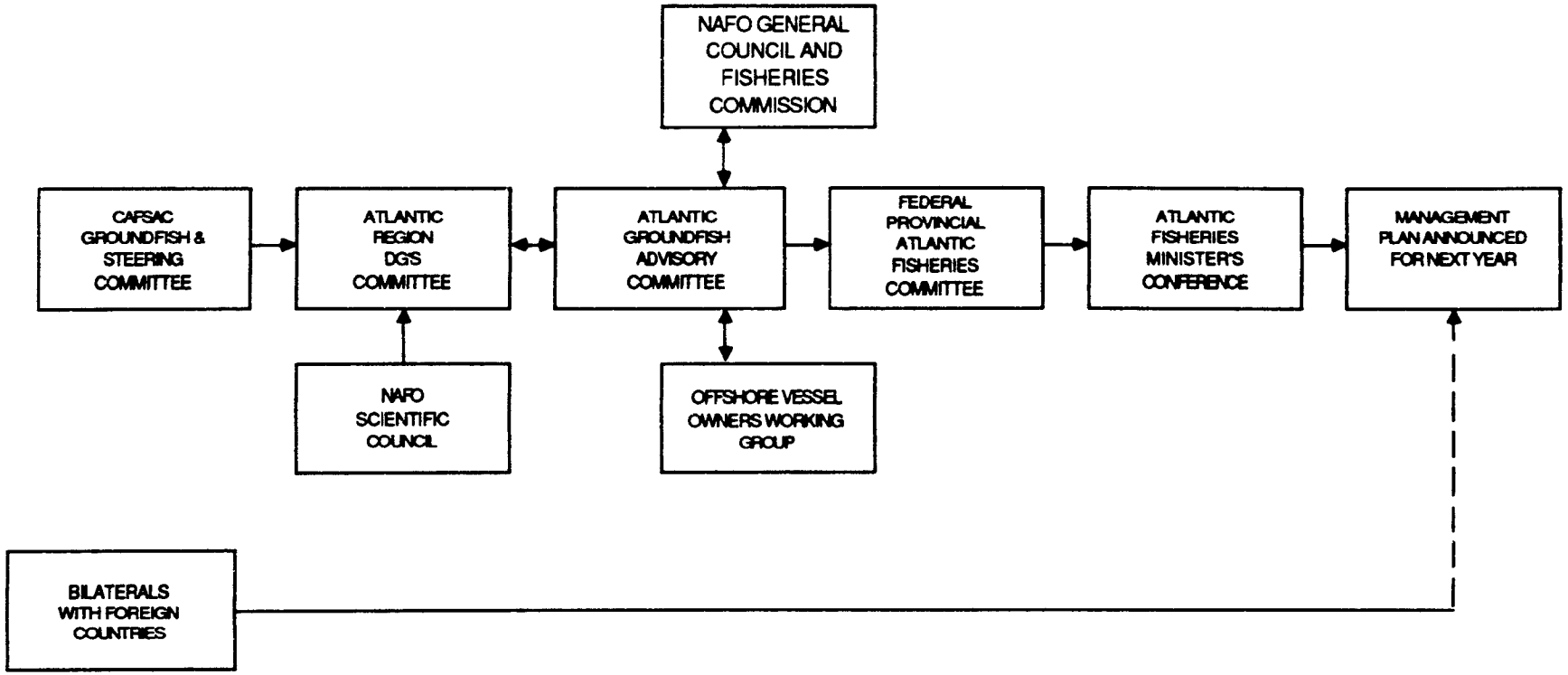
GROUNDFISH	STOCKS/NAFO DIVISION	JAN.FEB.MAR.APR.	MAY	JUNE	JULY/AUG.	SEPT.	OCT.	NOV.	DEC.
a) Canadian stocks (Inside 200 mi.)	Cod 2GH, 2J3KL, 3Ps, 4RS, 3Pn, 4Vn,4T, 4VsW, 4X Haddock - 4VWX+5 Pollock 4VWX+5 Redfish - 2 + 3K, 3O, 3Ps, 4RST, 4VX American Plaice 2 + 3K, 3Ps, 4T Witch 2J, 3KL, 3Ps, 4Rs Greenland Halibut 2J+3KL, 3Ps, 4RS Silver Hake 4VWX White Hake 3LNO, 4T Argentine 4VWX Round Nose Grenadier 2 + 3 Other Groundfish 5 + 6	Bilaterals with Foreign Countries on Fishing Plans and Allocations (ongoing) CAFSAC Steering Committee	CAFSAC Groundfish Sub-committee	Atlantic Region DGs Committee Atlantic Groundfish Advisory Committee NAFO Scientific Council			OVOWG* and IOG**	Federal Provincial Atlantic Fisheries Committee	Atlantic Fisheries Ministers Conference Management Plan Announced for Next Year
b) Canada/NAFO (Stocks overlapping and outside 200 mi.)	Cod 3M, 3NO Redfish 3M, 3LN American Plaice 3M, 3LNO Yellowtail 3LNO Witch 3NO Squid 3 + 4					NAFO General Council & Fisheries Commission Annual Meeting			

* Offshore Vessel Owners Working Group (OVOWG)
** Independent Offshore Group (IOG)

Fig. 4.6 Atlantic groundfish management flow.

Source: Atlantic Operations Directorate, Department of Fisheries and Oceans, Ottawa

ATLANTIC GROUNDFISH MANAGEMENT FLOW



which shape the conduct and future of the fisheries. As management problems grow more complex, the importance of these groups becomes more significant." (DFO, 1982a)

Despite this emphasis, a cursory examination of the mandates and composition of these various groups suggests a patchwork of area and species advisory groups, with no consistent thread or pattern to the consultative structure. The only global group was MAC which was increasingly used as the major consultative body until it was replaced in 1987 by a new Pacific Regional Council (PARC).

Overall, on both the Atlantic and Pacific coasts elaborate consultative structures were devised in the post-extension era. Much of the energy of these committees was focused on allocation of a finite pie among competing user groups. While decision-making rested with the federal Minister responsible for fisheries, in instances where the consultative process functioned well and consensus was achieved, this consensus impacted significantly on policy development. In the absence of consensus, DFO and the Minister were left to reconciling the conflicting interests of the various stake-holders.

5. CONCLUSION

To manage the new 200-mile zone, Canada in the late 1970s increased significantly its surveillance, enforcement and scientific research capability. It established a more structured decision-making process for both the foreign and domestic fisheries.

Mechanisms for peer review of the scientific input to management decisions were devised and implemented for the domestic fisheries, as well as revised mechanisms for the international fisheries for straddling stocks and stocks beyond the zone.

Elaborate consultative structures were devised to provide for client input into the decision-making process. Annual

cycles of information flow and decision-making were designed for the major fisheries, e.g. the Atlantic groundfish fishery. Decisions took the form of Annual Fishing Plans for the major species or species groups. These Plans attempted to allocate the available resource "equitably" among the competing user groups, as well as to meet conservation objectives.

Because of the considerable administrative flexibility permitted by fisheries legislation, Canada was able to modify these mechanisms to suit changing circumstances as the impact of the 200-mile zone became evident. On the surface, Canada appeared well positioned to take advantage of the opportunities provided by the 200-mile zone. In the next two chapters I assess the impact of the Canadian 200-mile fisheries zone in terms of benefits obtained, problems encountered and constraints on the full realization of the apparent opportunities.

CHAPTER V

ASSESSING THE IMPACT OF THE 200-MILE FISHERIES ZONE - I - BENEFITS

1. INTRODUCTION

Canada's extension of fisheries jurisdiction to 200 miles appeared to set the scene for an expanded and more prosperous Canadian fishery. Expectations were high in many sectors of the fishing industry that the 200-mile zone signalled the beginning of a bonanza. Several of the coastal provinces, e.g. Newfoundland and Nova Scotia, and many in the fishing industry advocated a rapid expansion of Canada's harvesting and processing capability to take advantage of the opportunities the new zone would make available. The federal government was almost alone in advising a cautious approach to the development of an expanded Canadian fishery in the new zone (Parsons, In Press).

Canada did benefit considerably by its extension of fisheries jurisdiction. The benefits came through increased management authority over a vast area with major fish resources, through the gradual displacement of foreign fisheries from the Canadian zone and through the development of Canadian fisheries in areas and for species not previously utilized by Canada. The most important benefits came from the rebuilding of fish stocks which had been overfished in the pre-extension era.

2. INCREASED MANAGEMENT AUTHORITY OVER A VAST AREA AND MAJOR FISH RESOURCES

Canada was a major beneficiary of the Law of the Sea negotiations. With the second largest continental shelf in the world and one of the largest fishing zones after extended jurisdiction in 1977, implementation of the Law of the Sea

Convention held great promise for Canada. Johnston (1985) argued that Canada "might be regarded as the country which had the most to gain, in relative, if not absolute resource terms, from the law of the sea." Canada's new 200-mile fishing zone was one of the largest in the world. Sanger (1987) ranked Canada seventh in terms of area of the new 200-mile zones. Alexander and Hodgson (1974-1975) ranked Canada fifth behind the United States (1st), Australia (2nd), Indonesia (3rd) and New Zealand (4th). Johnston (1985) calculated that, "if one adds in those Arctic Ocean areas which, technically considered, might be regarded as falling under the UNCLOS III regime of internal waters, Canada is probably to be ranked third or fourth among the world's largest gainers of surface area, and second or third, with the depth dimension of ocean space." By any measure, Canada has an extremely large 200-mile fishing zone.

The introduction of this zone had a dramatic impact. The immediate effect was to bring the major fish resources within 200 miles of the Canadian coast under more effective control. Although a few stocks on the Nose and Tail of the Grand Banks straddle the boundary and could be fished by foreigners outside the Canadian 200-mile limit, more than 90 percent of the stocks of commercial significance off the Canadian Atlantic coast occurred within the Canadian zone.

The major impact in terms of bringing fish resources under Canadian management was on the Atlantic coast. The Atlantic continental shelf extends beyond 200 miles on the Nose and Tail of the Grand Bank whereas on the west coast the continental shelf is very narrow-only 35 to 40 miles in breadth. The 200-mile fisheries zone brought the important Atlantic groundfish fishery under Canadian management, with the exception of the few stocks straddling the boundary on the Grand Bank and three relatively unimportant stocks on the Flemish Cap beyond 200 miles (see The Straddling Stocks VI, section 4.1). Prior to extension the Atlantic groundfish

fishery was managed by ICNAF, with varying portions of various stocks occurring within the Canadian 12-mile territorial sea.

The impact on the Atlantic herring fishery was much less significant since most stocks, with the exception of that on Georges Bank, spent most of their life cycle, and were fished, within Canadian internal waters. Similarly, most of the major shellfish resources, e.g. lobsters, crabs, occurred within Canadian internal waters prior to the 200-mile fisheries zone. The major exceptions were the Georges Bank scallops and the shrimp stocks off Labrador and northeast Newfoundland.

Another resource affected significantly by extended jurisdiction was the major capelin stocks off northeast Newfoundland-Labrador and on the Grand Bank.

On the Pacific coast, the resource implications of the 200-mile zone were much less significant. The major Pacific salmon fishery occurred within Canadian or U.S. internal waters prior to extension. Interceptions of Canadian-origin salmon on the high seas were not affected directly by the establishment of the 200-mile fisheries zones. Interception of Canadian-origin salmon by U.S. fishermen and U.S.-origin salmon by Canadian fishermen continued to be a problem until agreement on a Pacific Salmon Treaty was achieved in 1985. This Treaty did not solve all the interceptions problems but it provided the framework for the negotiation of long term and annual sharing arrangements.

B.C. herring were fished exclusively by Canadian fishermen in Canadian waters prior to extension. Their management was not affected significantly by establishment of the 200-mile zone. Similarly, the shellfish fisheries in British Columbia were prosecuted close to the coast.

The major B.C. groundfish fishery for halibut was affected substantially by extended jurisdiction. Although the International Pacific Halibut Commission continued to manage the resource, Canadian fishermen were excluded from fishing off Alaska after an initial phase-out period. Similarly, U.S.

fishermen were excluded from fishing groundfish off British Columbia.

The foreign fisheries for B.C. groundfish, although small in comparison with those on the Atlantic coast, had occurred adjacent to but outside Canada's 12-mile territorial sea. Thus the 200-mile fisheries zone brought these resources entirely under Canadian management for the first time.

Overall, the most significant impact of the 200-mile fisheries zone occurred on the Atlantic coast, where most of the major groundfish resource was brought under Canadian management. Problems occurred with the management of those stocks which straddled and occurred beyond the 200-mile fisheries limit. These are discussed in the next chapter.

3. IMPACT ON FOREIGN FISHERIES IN THE CANADIAN ZONE

3.1 General

Canada had gained control over considerable fish resources previously subject to international high-seas exploitation. With Canada's rights to manage and exploit these resources came certain obligations. Leonard Legault, the negotiator who handled Canada's fisheries negotiations during the transition to extended jurisdiction, summarized the basic premises of the new regime in a speech to the Canadian Labour Congress in January 1977:

> "One of the most basic elements of this consensus (UNCLOS) is the principle of optimum utilization, which means simply that coastal states will not play dog in the manger - will not allow fish stocks under their jurisdiction to die of old age and go to waste - but rather will allow other countries access to such portions of the stocks as may be surplus to the coastal state's harvesting capacity, as determined by the coastal state and subject to terms and conditions established by the coastal state.... The principle of optimum utilization in no way represents a limitation on our sovereign rights.

On the contrary. We will determine each year the TACs for the various species of our 200-mile zone; we will determine what is the Canadian harvesting capacity in respect of these species; we will determine what may be surplus to our harvesting capacity; and we will determine who will have access to any such surplus and under what terms and conditions." (Legault, 1977)

Canada had extended its jurisdiction in the context of the developing consensus on the Law of the Sea and had undertaken to manage the fisheries of the extended zone in accordance with the general principles being developed at UNCLOS III. Article 61 of the LOS Consolidated Negotiating Text provided that the coastal state would set the Total Allowable Catch "to maintain or restore populations of harvested species at levels which can produce the maximum sustained yield, as qualified by relevant environmental and economic factors, including the economic needs of coastal fishing communities." Article 62 provided that "...the coastal state shall determine its capacity to harvest the living resources of the exclusive economic zone." Where the coastal state does not have the capacity to harvest the entire allowable catch, it shall... "give other states access to the surplus of the allowable catch."

3.2 Atlantic Coast

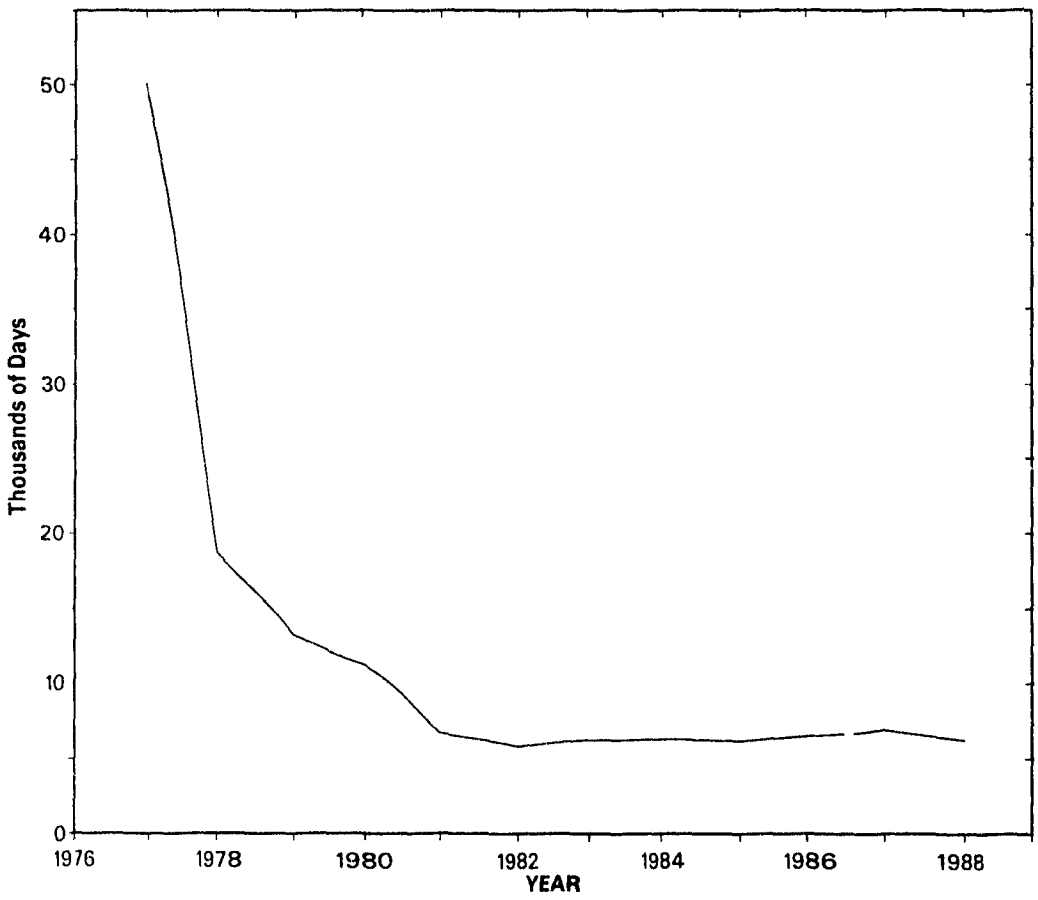
3.2.1. General Trends

Over time foreign fishing in the Canadian zone diminished substantially compared with the level of foreign effort and catches in the late 1960s and early 1970s. Part of this reduction was achieved multilaterally in the year or two prior to extended jurisdiction but the major impact became evident in the post-extension period (see Figure 5-1).

After jurisdiction was extended there appeared to be surpluses to Canadian harvesting capacity in many stocks brought under Canadian jurisdiction. Foreign fleets were

Fig. 5.1 Trend in number of days fished by foreign fishing vessels in the Canadian zone, 1977-1988

Source: DFO Regulations and Enforcement Branch, Ottawa


50
40
30
20
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Thousands of Days
1976
1978
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1982
1984
1986
1988
YEAR

given access to these surpluses under specific terms and conditions of benefit to Canada. Over the following decade the situation changed dramatically. As the Canadian fleet demonstrated it could take most of the Total Allowable Catches for most species, the surpluses diminished. Canadian harvesting capacity replaced foreign fleets in many important stocks.

This occurred as early as 1977 and 1978 on the Atlantic coast for a number of fisheries from which the foreign fleet had formerly harvested a substantial portion of the TAC. Examples were cod, haddock, pollock and herring on the Scotian Shelf, American plaice and yellowtail flounder on the Grand Banks, and flounders generally on the Scotian Shelf. Early in the new regime the foreign allocations of cod, redfish and flatfish off Newfoundland and Labrador were also substantially reduced with a corresponding increase in the Canadian shares for these species.

In the post-extension era important policy issues arose concerning the definition and use of "surpluses". Immediately following extension, Canadian fishermen faced a shortage of traditional groundfish in traditional areas and began to fish farther afield. Despite this, there were species and stocks where the Total Allowable Catch exceeded the harvesting capacity of the existing Canadian fleet. As Canadians began to redirect fishing effort to species and areas where they had previously fished little, the surpluses available for allocation to foreign countries in the Canadian zone diminished.

One striking example of this involved the northern cod stock. Foreign countries had harvested 310,000 to 395,000 tons from this stock in the early 1970s (1970-74). Following extension, the amount available for foreign allocation decreased from 93 140 tons in 1977 to 20,700 tons in 1980. By 1981 there was no longer any surplus. The question of allocating non-surplus cod to foreigners became an important

policy issue. During the period from 1981 to 1983, 25,000 tons of "non-surplus" northern cod were reserved for foreign allocation.

A key dimension of the foreign allocations debate revolved around the criteria for allocation of the available surpluses (and temporarily specified quantities of non-surplus fish) among countries wishing to fish in the Canadian zone. Although Canadian allocations policy evolved over the first decade of extended jurisdiction, one consistent element was the search for cooperation in conservation of the stocks which straddle the Canadian 200-mile limit. Canada had been unsuccessful in the last days of UNCLOS III in securing recognition of a coastal State right to manage stocks straddling the 200-mile limit. This failure bedeviled Canadian fisheries management in the 1980s. Foreign overfishing of stocks beyond the 200-mile limit became a matter of increasing concern to Canada in the late 1980s. The attempts to deal with this problem through the establishment of a new multilateral fisheries organization, the Northwest Atlantic Fisheries Organization (NAFO), and various bilateral negotiations are described in the next chapter (Chapter VI, section 4.1).

A primary objective of Canadian policy since 1977 has been to have Canadian fishermen harvest whatever fish in the Canadian zone can be harvested profitably by Canadians. At the same time, growth in harvesting capacity was constrained to foster improved profitability of existing operators. The objective of having Canadian fishermen harvest the lion's share of fish available within the Canadian zone was largely achieved in the 1980s. Canada's share of Atlantic coast finfish allocations increased from 18.3 percent in 1974 to 44.9 percent in 1978. By 1984 Canada had secured 77 percent of the total allocations within and outside 200 miles. The remaining 23 percent consisted primarily of stocks entirely or partially outside Canadian jurisdiction and stocks within the

Canadian 200-mile zone which at that time were of little interest to Canadian fishermen, e.g. silver hake, roundnose grenadier and argentines (DFO, 1985a).

Foreign allocations policy evolved through three phases between 1977 and 1990.

3.2.2. Phase I - Allocations for Access

Phase I, which lasted from 1976 to 1982, can be characterized as "stability and allocations for access." During this period significant surpluses were available for allocation. These surpluses were allocated only to countries which had fished traditionally off the Canadian coast. In light of the anticipated decrease in the surplus, it was considered inappropriate to make allocations to "new flags", i.e. countries that had not previously fished in the area. Usually, allocations were given only to countries which had entered into a bilateral fisheries treaty with Canada.

In Phase I, emphasis was placed on continued good relations with countries which had fished traditionally off the Canadian coast. Expectations were high that considerably increased quantities of fish would be available to Canada in the mid-1980s, as the stocks rebuilt. Some sectors of the industry were concerned that Canada might not be able to market its increased catch. Therefore, there was pressure to diversify markets. This led to the "allocations for access" policy. Canada sought commitments from the countries receiving allocations that they would initiate or increase imports of processed Canadian fish products, or improve access to their markets for such products.

Towards the end of Phase I, attention focused on the appropriateness of making "non-surplus" allocations in return for market preferences. In 1980, Canada offered to enter into long-term agreements with the EC, Spain and Portugal in which specific allocations in the Canadian zone would be made in return for specific market commitments with respect to

Canadian fish products. This resulted, after protracted negotiations and major controversy within Canada, in a Long-Term Agreement (LTA) with the EC. Negotiations with Spain were unfruitful. The failure of those negotiations was linked to the problem of overfishing of the straddling stocks and shaped the late 1980s confrontation between Canada and the EC respecting the management of stocks on the Nose and Tail of the Grand Banks. Ironically, Portugal, which chose not to enter into negotiations for a long-term agreement, but opted instead for year-to-year agreements on allocations and commercial cooperation, maintained a satisfactory trading relationship with Canada up to the time of its accession to the EC in 1986. For details, see Parsons (In Press).

By 1981 there was no longer a surplus of northern cod, the species of primary interest to the western European countries. Following a Northern Cod Seminar in 1979, the federal government decided to set aside 25,000 tons of northern cod for foreign allocations. In 1981 the Canadian offshore sector harvested its quota in just two months and clamoured for more allocations for the offshore fleet. The industry argued that the LTA with the EC was failing to produce expected benefits and that it was counterproductive to conduct negotiations with Spain. It generally opposed the allocation of "non-surplus" fish for any purpose (Unpublished reports on consultations with fishing industry, DFO, International Fisheries Directorate, Ottawa).

3.2.3. Phase II - Reward for Past Performance

DFO convened a government-industry seminar at Oak Island, Nova Scotia, in August 1982 to review the international fisheries relations policy. This Seminar resulted in a modification of allocations policy and a new phase - Phase II, in which the operative principle became "Reward for Past Performance." This approach was recommended by the Task Force on Atlantic Fisheries and accepted by the federal Cabinet.

The policy directions suggested by the Task Force were consistent with industry advice at the Oak Island I Seminar. The Task Force recommended that the government:

> "1. Allocate non-surplus resources to foreigners as part of agreement for reciprocal fishing rights by fishing vessels across international boundaries (e.g. with Greenland in the Davis Strait);
>
> "2. Allocate resources that are currently surplus to Canadian harvesting capacity (e.g. squid) and a fixed amount of 'non-surplus' resources (e.g. cod) preferentially to those countries that maintain a satisfactory fisheries relationship with Canada (including fisheries trade and conservation). Allocations of non-surplus resources should be made after the fact - that is, in a subsequent year as a reward for satisfactory behaviour in the previous year, rather than as an incentive. In particular, the government should not negotiate access by foreign vessels to non-surplus resources in return for access to markets." (Kirby, 1982).

The Task Force viewed the allocation of non-surplus fish as "expensive as well as unwise from a marketing point of view." Because market access was inherently more uncertain and more subject to manipulation than catching an allocation of fish in the Canadian zone, allocations for access was considered to be "a one-sided bargain." For that reason the Task Force suggested that access to non-surplus allocations be strictly limited in total, be allocated unilaterally on the basis of good performance and be offered to selected nations "after the fact" rather than in return for a promise of access to markets. The Task Force left open the possibility of continuing to seek benefits, including greater access to markets, in return for allocation of surplus resources.

The Reward approach of Phase II was reasonably successful with Portugal (which received allocations of surplus and non-

surplus fish) until it joined the EC in 1986. Some progress was also made with the Eastern Bloc countries. Conservation cooperation was maintained and some gains were made in market access (B. Applebaum, Ottawa, Personal Communication).

There were two major shortcomings in the Phase II approach. Continued allocations of non-surplus northern cod to Portugal meant that there was less fish available to the Canadian fleet than it could harvest. This policy also continued the link between market development and fish allocations in the Canadian zone. This posed a threat to trade expansion should allocations have to be reduced. Also during the 1982-86 period the problem of overfishing outside 200 miles began to escalate. The Reward for Past Performance policy did little to arrest that trend because allocations to foreign countries in the Canadian zone were decreasing.

3.2.4. Phase III - Cooperation on Conservation

In August 1985, DFO convened another government - industry seminar on international fisheries policy in Oak Island, Nova Scotia (Oak Island II). Seminar participants recognized that there was a growing conservation problem outside 200 miles. They concluded that the allocation of non-surplus cod to the EC under the Long-Term Agreement and to Portugal annually had not been beneficial to Canadian suppliers. Spain had, since 1981, been fishing freely outside 200 miles and had blocked imports of Canadian fish products to its market in an attempt to gain access to Canadian waters. It was suspected that the EC, with the accession of Spain and Portugal to the Community in 1986, would use access to its market in an attempt to gain preferential allocations in the Canadian zone. The allocation of non-surplus fish by Canada, starting in 1981, had led to pressures to increase the amount of non-surplus allocations.

The Canadian industry and governments were concerned about these developments and concluded that the time had come

to delink allocations and access to markets. Seminar participants recommended that in future Canada allocate only surplus resources in accordance with the provisions of the Law of the Sea Convention and that the over-riding priority for benefits from surplus allocations should be cooperation in conservation. Instead of rewarding "good behaviour" outside 200 miles, the emphasis should be placed on punishing "bad behaviour" by cutting off access to surplus allocations inside the zone (B. Applebaum, Ottawa, Personal Communication).

The Oak Island II recommendations represented a significant departure from the recommendations of Oak Island I and the Task Force on Atlantic Fisheries. The attempt to improve market access in free-market countries through the use of fish allocations was abandoned. The federal government accepted these recommendations as the basis for a modified international fisheries relations policy, which emphasized Cooperation on Conservation. This represented a new phase - Phase III - in foreign allocations policy, which has been in effect since 1986.

The essential elements of the new policy were:

1. Apart from existing treaty commitments (e.g. ICNAF and the Canada - France 1972 Agreement), Canada would no longer grant non-surplus allocations;
2. Surplus allocations would be granted only to countries which cooperated in conservation efforts both inside and outside the 200-mile zone; and
3. Commercial cooperation would no longer be a factor except as a "by-catch" in agreements with East Bloc countries.

The essential underpinning of this approach was to keep trade matters separate from fisheries allocations.

3.3. Pacific Coast

The impact of the 200-mile limit on foreign fisheries off the Canadian Pacific coast was considerably different. Prior

to extension there had been relatively small-scale foreign fisheries (with the exception of U.S. fishermen fishing for salmon and halibut) in the Canadian zone compared with the Atlantic.

The major impact of extended jurisdiction on the B.C. salmon fishery was upon the patterns of interception of U.S. origin-salmon by Canadian fishermen and Canadian-origin salmon by U.S. fishermen. Historically, the quantity of Canadian salmon taken by U.S. fishermen exceeded considerably the quantity of U.S. salmon taken by Canadian fishermen. In the years immediately prior to extended fisheries jurisdiction that difference was reduced because of the capture by Canadian fishermen of U.S. hatchery fish produced in Oregon and Washington. Copes (1981) observed that "the advent of the 200-mile limit probably has had an adverse impact on Canada's position in the interception contest." U.S. fishermen were in a position to intercept considerable quantities of Canadian-origin fish off Alaska, Canadians could continue to intercept U.S. origin salmon migrating to Washington and Oregon, but Canadian fishermen after 1980 were barred from fishing salmon off Alaska and Washington. The question of relative balance of interceptions had been argued for decades. Years of negotiation finally resulted in the Canada-USA Pacific Salmon Treaty in 1985 and the establishment of the Pacific Salmon Commission. The implications of this are examined in Chapter VI, section 4.3.

Of the two next most valuable B.C. fisheries, herring and halibut, Canada's access to and management of herring was virtually unaffected by the 200-mile limit. The Canadian halibut fishery, on the other hand, was adversely affected by extended jurisdiction. The halibut fishery had been in decline in the pre-extension period. The 1977 Canadian Pacific halibut catch was about 25-30 percent of the catch during the 1956-65 period.

In the decades prior to 1977 Canadian fishermen had taken the bulk of their catch in waters off the U.S. coast. For example, during the decade 1956-65 Canada caught an average of 14,110 tons of halibut. Of this amount, 5,870 tons (41.6 percent) was taken in what became the Canadian zone in 1977 and 8,240 tons (58.4 percent) off the U.S. coast. During the same period U.S. fishermen caught less than 10 percent of their catch off the Canadian coast. In the decade just before extension the percentage caught by Canadians off the U.S. coast dropped to about 50 percent.

The 200-mile zone resulted in the reduction of access to each other's zones. The allowable Canadian halibut catch in the U.S. zone was reduced significantly in the late 1970s. Initial attempts to negotiate a mutually satisfactory reciprocal fishing arrangement were unsuccessful. In June 1978, Canadian fishermen were prevented access to the U.S. zone and vice versa. In February 1979, a phase-out arrangement was negotiated for the Pacific coast whereby Canadian fishermen were permitted to harvest two million pounds of halibut off Alaska in 1979 and one million pounds in 1980. U.S. fishermen were allowed to harvest 14.3 million pounds of groundfish off British Columbia over the same two year period.

As a result, the Canadian fleet had to reduce its operations because it now had access to a more limited portion of the halibut resource. DFO implemented a "halibut relocation plan" in an attempt to reduce the size of the fleet. There were three aspects to this plan:

1. Vessels with several licences were encouraged to fish species other than halibut;
2. Vessels were offered a grant for gear conversion to fish black cod, an underutilized species; and
3. A minimum landing requirement (3,000 pounds of halibut in 1977 or 1978 on gear other than troll) was imposed for the issuance of licences to

continue fishing for halibut. This resulted in the denial of halibut licences to about 400 part-time halibut fishermen.

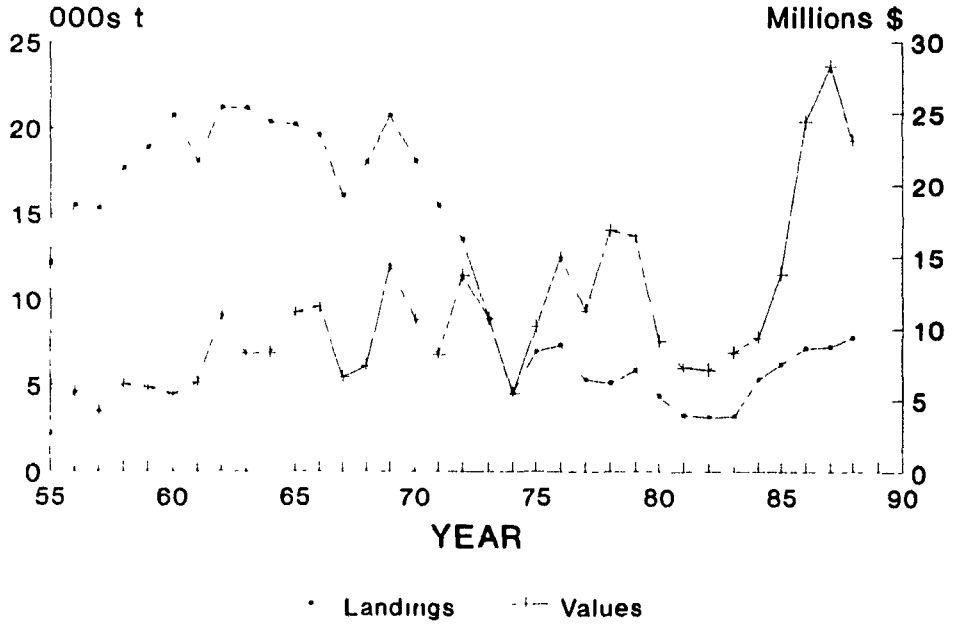
These measures reduced the fishing capacity of the fleet by about 20 percent compared with a 58 percent reduction in the catch available to the Canadian fleet (Copes and Cook, 1982). Flexibility in the appeal process, however, led to approval of additional licences with 422 vessels licensed by 1981. Prior to extended jurisdiction and limited entry, less than 100 vessels had relied primarily on the halibut fishery in Canadian waters. Dislocation from U.S. waters resulted in considerable excess capacity in the post-extension era. The Canadian catch of Pacific halibut decreased from 5,200-5,300 tons in 1977-78 to 3,100-3,200 tons during 1981-83. It subsequently increased to around 6,000 tons in 1987 and then declined again to 3,500 tons in 1990 (Figure 5-2).

The one component of the British Columbia fishery that clearly benefited from the 200-mile limit was the groundfish fishery (excluding halibut). This fishery harvests a variety of species, including Pacific cod, black cod, pollock, flatfishes (other than halibut), rockfish, hake and dogfish. U.S. fishermen fished groundfish off British Columbia for decades, with the U.S. fishery accounting for 47 percent of the catch in 1964. The foreign fishery (other than that by the U.S.) commenced when the USSR started fishing groundfish off British Columbia in 1965 (Table 5-1). The USSR was joined by Japan in 1966. These were the only two foreign countries fishing groundfish until 1975 when Poland, the Republic of Korea and the German Democratic Republic started fishing these stocks. The GDR fished for only one year, but Poland and the Republic of Korea continued fishing there in 1976.

The catch by U.S. fishermen was roughly as large as that by Canadian fishermen during 1964-1970 but averaged less than half the Canadian catch during 1972-1976. The Canadian catch

Fig. 5.2 Canadian landings (000's tons) and landed value (millions of dollars) of Pacific halibut, 1955-1988.

Source: DFO Annual Statistical Reviews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20
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60
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85
90
YEAR
Landings
Values

Table 5.1 Groundfish Catches off British Columbia

Year	Canada	USA	USSR	Japan	Poland	Korea	GDR	Total
1964	13,156	11,451	-	-	-	-	-	24,607
1965	18,458	16,385	14,000*	-	-	-	-	48,843
1966	23,594	19,252	60,000	6,386	-	-	-	109,232
1967	15,814	16,293	21,373*	16,270	-	-	-	69,750
1968	17,781	12,543	54,135	19,988	-		-	104,447
1969	16,778	16,009	72,519	19,606	-	-	-	124,912
1970	11,626	13,705	25,577	14,497	-	-	-	65,405
1971	14,476	11,753	6,008	8,678	-		-	40,915
1972	20,980	10,975	8,328	17,842	-	-	-	58,125
1973	22,613	12,450	16,207	15,676	-		-	66,946
1974	19,854	10,854	2,651	28,351	-	-	-	61,710
1975	23,952	8,853	3,814	6,327	26,273	1,301	2,000	82,520
1976	26,040	8,877	4,264	11,891	6,739	2,358	-	60,169
1977	27,635	10,635	560	8,134	3,327	216	-	50,507
1978	33,597	NA	700	3,364	589	-	-	38,250
1979	42,718	NA**	0	3,637	4,263	-	-	50,618
1980	51,354	NA**	78	817	4,456		-	56,705
1981	54,385		227	187	3,189	-	-	57,988
1982	55,490		0	2,237	10,357	-	-	68,084
1983	64,193		0	0	13,177	-	-	77,370
1984	67,415		0	0	13,203	-	-	80,618
1985	58,397		0	0	10,533	-	-	68,930
1986	82,018		8,138	0	15,604	-	-	105,760
1987	118,196		11,737	0	9,716	-	-	139,649
1988	117,223		1,330	0	26,386	-	-	144,939
1989	129,681		13,322	0	18,254	-	-	161,257
1990	139,685		0	0	3,439	-	-	143,124

* Rough estimate

** Under a bilateral agreement U.S. fishermen were allowed to catch 14.3 million pounds of groundfish off British Columbia over the two-year period 1979 and 1980.

Source: 1964-1977 - (Copes 1981)

1978-1990 Department of Fisheries and Oceans, Biological Sciences Branch, Pacific Region.

more than doubled from 11,600 tons in 1970 to 26,000 tons in 1976. The total groundfish catch increased from 24,600 tons in 1964 to 109,000 tons in 1966, peaked at 124,900 tons in 1969 and thereafter fluctuated between 60,000-80,000 tons. The distant water fleets accounted for 73.8 percent of the catch in 1969. Their share declined to about 50 percent during the 1974-1976 period.

In 1977, Canadian scientists advised that some of the groundfish stocks, e.g. ocean perch, had been overfished. TACs were set at relatively low levels with the aim of rebuilding the stocks to levels which would permit a more viable Canadian fishery. However, since the Canadian fleet was unable to harvest the TACs of all species, Japan, Poland and the USSR were allocated various quantities of hake, sablefish, dogfish and rockfish in the first year of extended jurisdiction. Foreign allocations totalled 31,000 tons, consisting of 20,000 tons of hake, 3,000 tons of black cod (sablefish), 3,000 tons of rockfish and 5,000 tons of dogfish. Half the total consisted of hake allocations (7,500 tons each) to Poland and the USSR. Total foreign allocations decreased to 20,200 tons in 1978 and 14,750 tons in 1979.

Foreign quotas for rockfish and dogfish were eliminated in 1978, leaving Pacific hake as the only significant foreign groundfish fishery in the Canadian zone on the Pacific coast. Through the 1970s and 1980s joint ventures/direct sales, whereby Canadian fishing vessels would catch hake for delivery at sea to foreign factory trawlers, were used to develop a Canadian fishery for this species. Foreign allocations were used as an inducement to attract foreign partners for these ventures. Foreign allocations of Pacific hake fluctuated during the 1980s ranging from a low of 10,000 tons to Poland and the USSR in 1981 (5,000 tons each) to highs of 37,000 tons in 1987 (25,000 tons to Poland, 12,000 tons to the USSR) and 41,000 tons in 1988.

4. REBUILDING OF STOCKS OVERFISHED IN THE PRE-EXTENSION ERA

For the Canadian domestic fisheries on the Atlantic coast the period immediately following extended jurisdiction was a period of short-term pain with the expectation of long-term gain. Canada established low Total Allowable Catches for groundfish, for example, in order to begin the process of resource rebuilding. The amount of Atlantic groundfish available to the Canadian fleet in 1977 was insufficient to keep the fleet and onshore processing plants operating year-round. To deal with this problem, Canada introduced the first Annual Groundfish Plan and a complex system of allocating access among fleet sectors to spread the burden of conservation among all participants in the industry. The Fishing Plan process and the evolution of the domestic allocation of access regime are described by Parsons (In Press).

Early in the first year of extended jurisdiction, Fisheries Minister LeBlanc cautioned against expecting too much benefit too soon from the 200-mile zone. In a speech to the Rotary Club of St. John's on May 19, 1977, he observed:

> "Extended jurisdiction at last lets me speak to you in terms of opportunity. Opportunity, not only for Atlantic fishermen... but for the whole Atlantic economy.... The limit means nothing unless we use it right. Reaping its full advantages will take time and care. The new zone offers only potential, we cannot take its promise for granted" (DOE, 1977a).

LeBlanc spoke of making plans to use the resource better, to help "those who suffered most from the years of overfishing: the small man, the inshore man, with his own boat." He also spoke of pursuing prosperity by increasing not just the catch but the return per pound of the catch. This would necessitate upgrading fish quality.

While the federal government was speaking of rebuilding the resource and rebuilding the inshore fishery and increasing

the value of the catch, it was under considerable pressure from the Atlantic provinces (particularly Newfoundland and Nova Scotia) to expand the fleet. LeBlanc mentioned this in his St. John's speech when he said:

> "I might add that I have been urged to expand the fishing fleet, for example, with huge new freezer trawlers. Perhaps this would help the shipbuilders but I see no need yet of a huge new catching capacity, to re-rape the fishery just now when our existing fleet is only beginning to get out of trouble." (DOE, 1977a)

A few months later in Yarmouth on November 28, 1977, Minister LeBlanc again addressed the question of fleet expansion. He pointed out the recovery of the groundfish stocks would occur at a differential rate in different areas:

> "Only over time will the lowered fishing effort increase the amount of fish and the catch rates by our fishermen... (Our) plans can hardly include any vast fleet expansion. In almost no area of the Atlantic is our groundfish fleet getting anywhere near its catch rates of five years ago" (DOE, 1977b).

By this time Newfoundland and Nova Scotia were at work on a fleet development plan which called for an expenditure of $900 million on new fishing vessels (expansion and replacement).

LeBlanc's rhetorical response was:

> "Do we want to double a fleet that is getting half loads? I hardly think so." (DOE, 1977b)

There was considerable antagonism between the federal government and certain provincial governments on this issue. On the one hand, the provincial governments, and some large processors, saw a need to build more and bigger vessels to harvest the resources of the extended zone. On the other, the federal government believed, based on available scientific advice, that the increasing groundfish resource in future years would result in improved catch rates, which should first

be utilized to restore the profitability of the existing fleet. This controversy led to the first attempt by federal scientists to project anticipated catches over the next several years. Given the uncertainties involved in the scientific assessment process, this was an exercise fraught with considerable potential for error. The scientific projections indicated that a significant increase in TACs could be expected. Increasing stock abundance would result in increased catch rates for the existing fleet which would be capable of harvesting most of the increase in TACs of traditional finfish (DOE, 1978a).

Dr. Arthur May, then Acting Assistant Deputy Minister, Fisheries Management, of the Department of Fisheries and the Environment, in a speech to the Canadian Labour Congress, on January 13, 1977 described the Canadian approach to management of the new zone as follows:

> "The main thrust of the new 200-mile management regime is to rebuild the resource so as to provide increased opportunities for Canadian fishermen.... In order to rebuild these resources, we are applying stringent conservation measures to ensure that we do not replace foreign overfishing with Canadian overfishing. The 200-mile limit will not bring about an overnight miracle, but the long-range future is bright.... It will take between 5 and 10 years of strict management to bring about restoration of the resource. The severe conservation measures presently being implemented will begin that process" (DOE, 1977c).

By and large the federal government succeeded in containing the growth of the Canadian offshore fleet, although technological improvements undoubtedly led to some increase in fishing efficiency. There was some increase in the inshore sector to permit a rebuilding of the inshore fishery. As forecast, the Canadian fleet was able to harvest significantly increased quantities of fish as the stocks improved. Canadian

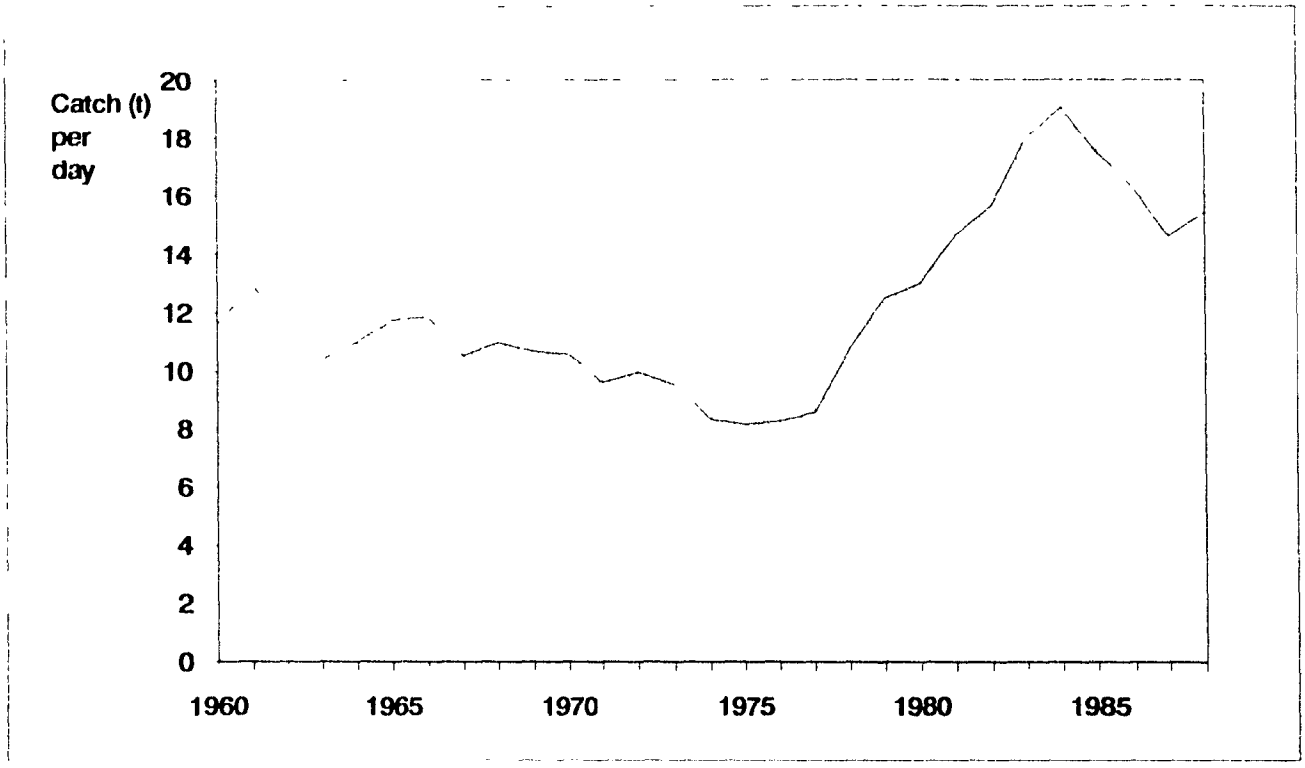
allocations of species under TAC management on the Atlantic coast increased from 409,400 tons in 1977 to 1,091,000 tons by 1984 (DFO, 1985a). Canadian catches of traditional groundfish species increased from 467,000 tons in 1977 to 744,000 tons in 1982, an increase of 59 percent. By 1986 catches had dropped to 688,000 tons, still 47 percent higher than the 1977 catch. Overall, Canadian catches of traditional groundfish were 50 percent higher in the 1980s than they were in 1977. The Canadian total Atlantic groundfish catch of 756,000 tons in 1987 was 80 percent higher than the low point of 1974.

Perhaps a more valuable measure of the impact was the increase in the catch rates of the large Canadian otter trawlers (Figure 5-3). Canadian offshore trawlers increased their catch rates to more than 15 to 19 tons of fish per day by 1982, compared with 8 tons per day in 1975. This increase in catch rates reduced harvesting costs, at a time when certain other costs of harvesting (e.g. fuel) were increasing. It appears likely that some of this increase in catch rate was due to technological innovations and changes in area and season fished, (e.g. a learning curve as Canadian trawlers gained experience in fishing northern cod in the winter offshore).

Doubleday *et al* (1989) examined trends in stock abundance up to 1983. The most comprehensive study of changes in stock abundance on the Canadian Atlantic coast over the past three decades is that of Pinhorn and Halliday (1990). They derived biomass indices for the various species from a variety of sources. Their analyses indicated that total cod biomass declined to approximately one quarter of its early 1960s levels by 1975-76 and about tripled thereafter (Figure 5-4). Cod was the major determinant of trends in groundfish catches and apparent trends in groundfish biomass. According to their analysis, the abundance of groundfish off the Canadian Atlantic coast (Subareas 2-4) more than halved between 1967

Fig. 5.3 Average catch per day by Canadian otter trawlers.

Source: DFO Fisheries Research Branch, Ottawa


Catch (t) per day
20
18
16
14
12
10
8
6
4
2
0
1960
1965
1970
1975
1980
1985

and 1975, remained stable between 1975 and 1976, then more than doubled between 1976 and 1984 (Figure 5-4). Patterns of decline and recovery for stocks inside the Canadian zone and straddling the boundary on the Grand Banks were broadly similar. On the other hand, stocks completely outside 200-miles on the Flemish Cap had different trends, with neither cod nor redfish showing recent abundance increases (Figure 5-5).

Pinhorn and Halliday concluded that fishing mortalities on cod stocks in the 1960s were, in most cases, about F=0.50, above F_{max} for most stocks. F increased in the early 1970s to about F=1.0 for several stocks in 1975-76. After 1977, Fs for cod were, on average, lower in comparison to the early 1970s but well above the target fishing mortality of $F_{0.1}$. Most cod stocks from 1977 to the late 1980s were fished at or near F_{max}.

Their analyses suggested that the overall biomass of commercial pelagic species halved between 1970-75 and 1978-80 from about 8 to 4 million tons and may have increased back to the early 1970s level by 1985. This is largely a reflection of trends in capelin biomass, which accounted for more than half of the total commercial pelagic biomass throughout much of the period under study. Mackerel declined in abundance throughout the 1970s by about half, then recovered substantially in the 1980s. Herring abundance declined from about 2.5 million tons in 1970 to about 700,000 tons in 1978-82, then increased to more than 1.5 million tons after 1984.

The exploitation rate for capelin appears to have been less than the target rate, with the major fluctuations in population resulting from effects of environmental fluctuations on recruitment (Leggett *et al*, 1984). On the other hand, exploitation rates played an important part in the dynamics of herring with Fs on the southern Gulf of St. Lawrence and Scotian Shelf stocks generally above $F_{0.1}$, although Fs on the southern Gulf stock were around $F_{0.1}$ in the mid-1980s.

Fig. 5.4 Biomass of groundfish species in subareas 2-4 in 1961-1986

Source: Pinhorn and Halliday (1990)

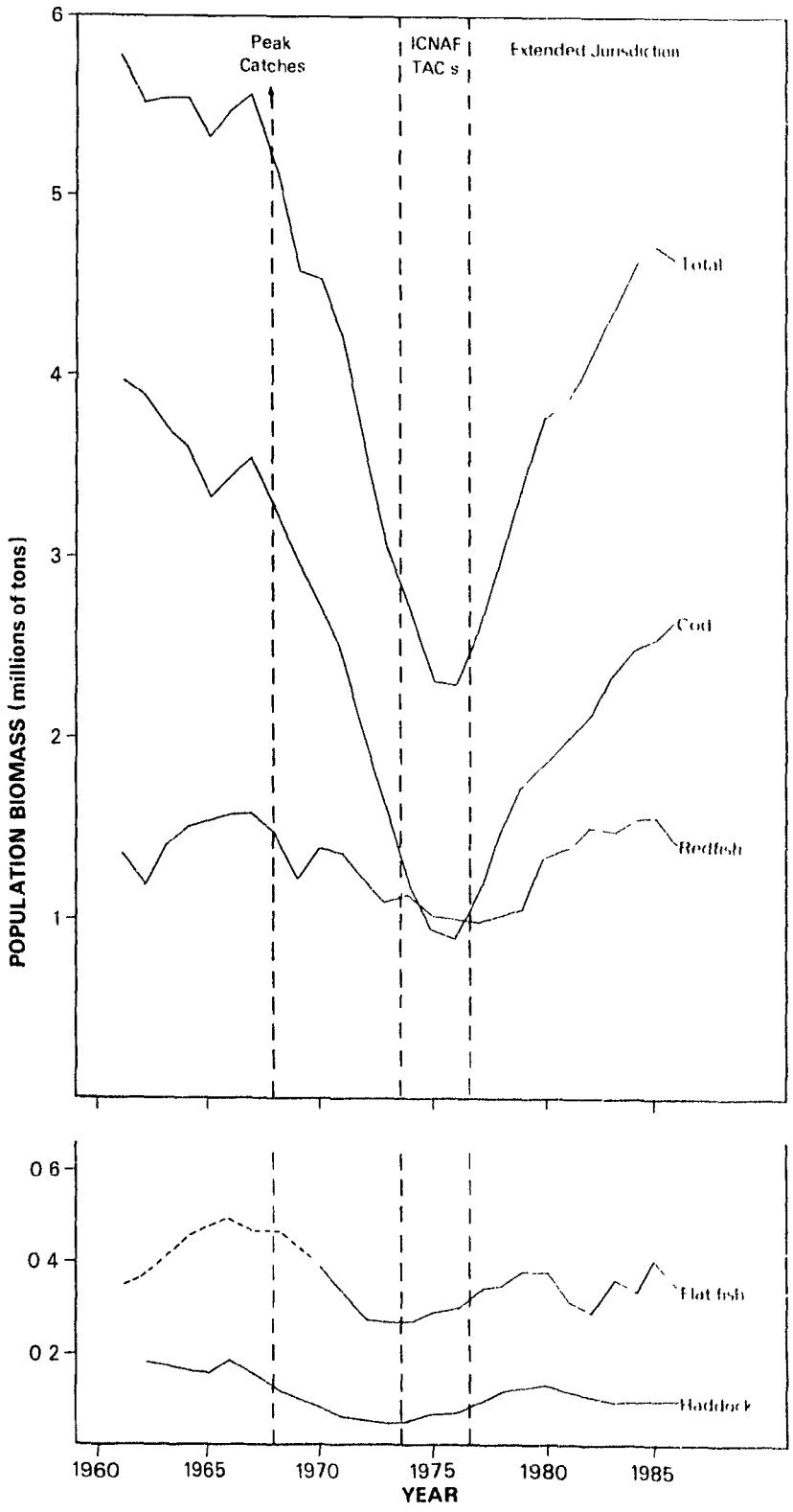
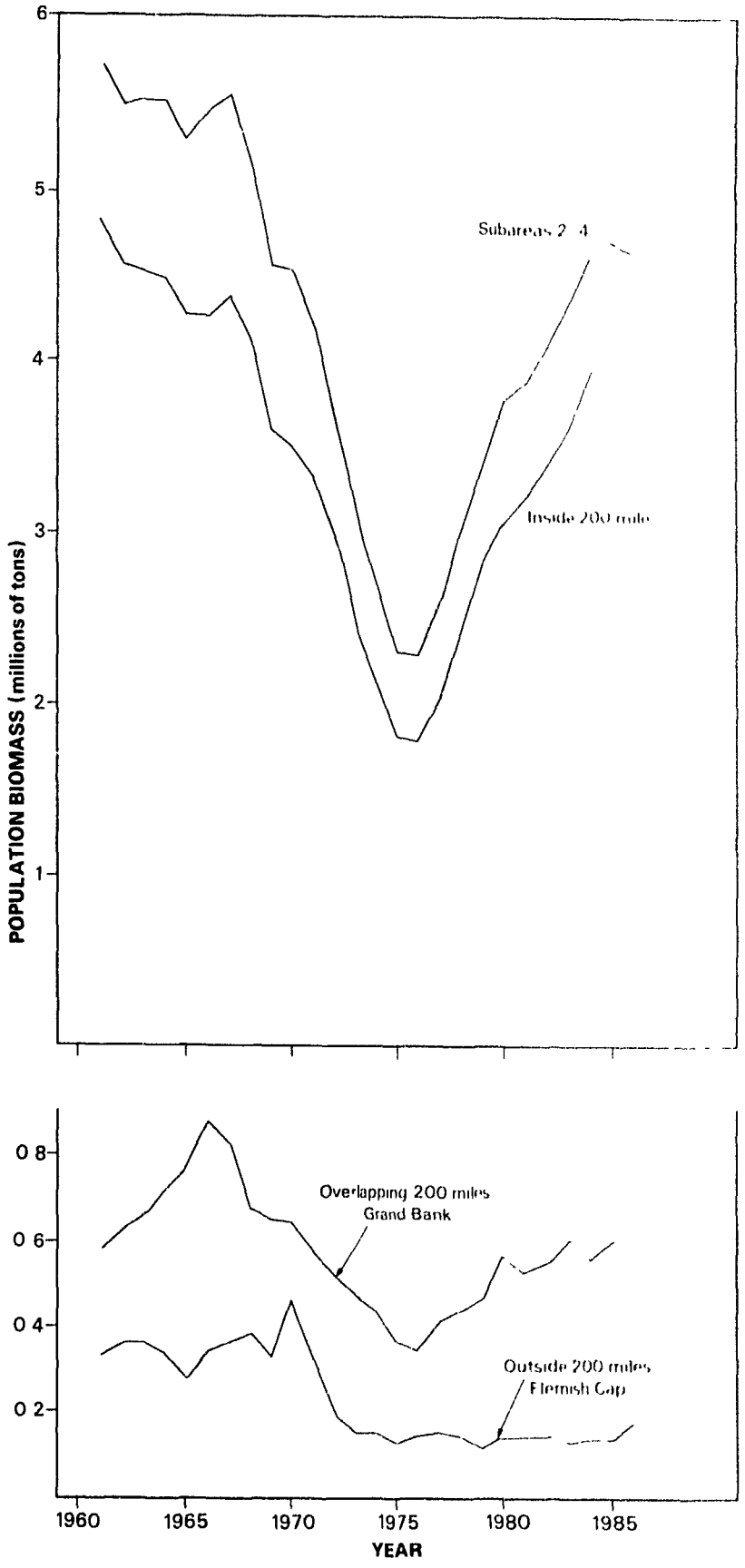

Peak
Catches
ICNAF
TAC's
Extended Jurisdiction
Total
Cod
Redfish
Flat fish
Haddock
POPULATION BIOMASS (millions of tons)
6
5
4
3
2
1
0 6
0 4
0 2
1960
1965
1970
1975
1980
1985
YEAR

Fig. 5.5 Biomass of exploited age groups of fully exploited groundfish species in subareas 2-4 in 1961-1986.

Source: Pinhorn and Halliday (1990)


POPULATION BIOMASS (millions of tons)
6
5
4
3
2
1
Subareas 2–4
Inside 200 mile
0 8
0 6
0 4
0 2
Overlapping 200 miles
Grand Bank
Outside 200 miles
Flemish Cap
1960
1965
1970
1975
1980
1985
YEAR

Pinhorn and Halliday (1990) concluded that "Canadian resource rehabilitation and conservation efforts appear to have met with a large degree of success overall." They observed that fishing mortality likely increased substantially after 1963, peaked sometime in the mid-1970s and became substantially lower after extension of jurisdiction. This is sufficient to explain the reversal of groundfish abundance trends.

One disturbing conclusion from their analysis was that Canada had not been successful in reducing F to $F_{0.1}$ for the stocks most important to the Canadian fishery. Except for haddock, post-1977 Fs have been reduced to about F_{max}. While Pinhorn and Halliday did not comment on the appropriateness of $F_{0.1}$ as the management objective, it is worth noting that one of the arguments advanced by STACRES for using a target fishing mortality of $F_{0.1}$ was that it would provide a margin of safety against errors in estimating stock abundance. Had Canada been using a target fishing mortality of F_{max} in the post-extension era, it is quite likely that Fs would have been well above F_{max} and the increases in stock abundance and catch rates witnessed in the post-1977 period would not have occurred. This provides evidence in favour of maintaining the cautious approach of striving to fish at $F_{0.1}$.

Pinhorn and Halliday (1990) concluded that a dramatic reversal of "exploitable biomass" trends occurred on the Atlantic coast coincidentally with Canadian extension of fisheries jurisdiction in 1977.

Koslow *et al* (1987) advanced an alternative hypothesis that ascribed these trends to a periodicity in resource productivity, associated with large scale environmental events and mediated through recruitment. This hypothesis implies that there was an underlying cycle in the production of groundfish stocks and that the international fishery of the late 1960s and early 1970s simply amplified the declining

trend in resource abundance. Under this hypothesis, the Canadian management regime amplified the increase in biomass which resulted from an increase in resource productivity coincident with extension of jurisdiction. For a more detailed discussion of the impact of environmental influences on fish productivity, see Living With Resource Variability in Chapter VI, Section 2.

On the basis of the available evidence, the hypothesis put forward by Pinhorn and Halliday linking groundfish biomass trends to major trends in the fishery seems plausible. In any event, Canadian groundfish fishermen clearly benefited from improved catch rates following the 200-mile limit. Increases in catch rates and catches, combined with the anticipation of future increases, triggered a wave of euphoria in certain sectors of the Atlantic industry. There were the provincial proposals for fleet expansion, which were resisted by the federal government. Some "leakage" occurred but this was moderate compared with what might have occurred had the federal government also embraced the Klondike attitude of many in the industry and provincial governments.

There were significant changes in the areas, seasons and species fished by Canadian offshore trawlers. While there was dislocation within the Canadian zone, fortunately there was no major dislocation because of the boundary claims of Canada's three neighbours on the east coast. Canadian vessels had done very little fishing on the Greenland side of Davis Strait (Subarea 0). Fishing in the area claimed by France continued into the 1980s with minimal disruption. Following the International Court of Justice decision in 1984, Canadians were excluded from the U.S. portion of Georges Bank but most Canadian fishing on Georges Bank had been conducted on that part which became Canadian waters as a result of the ICJ decision (Halliday *et al*, 1986).

One major consequence of extended jurisdiction on the Atlantic coast was a significant build-up in onshore

processing capacity, which was under the control of provincial governments. Groundfish freezing capacity increased 150 percent from 1974 to 1980 (Kirby, 1982). Private entrepreneurs, with assistance from provincial governments and the federal Department of Regional Economic Expansion (DREE), put in place more processing capacity than was warranted by the current or anticipated resource supply. Much of this excess processing capacity was debt-financed. DFO and DREE signed an agreement in 1981 whereby DREE would limit any future assistance to measures aimed at quality and productivity improvements. But this came too late to avert the build-up of processing overcapacity. With the surge in groundfish market demand in the mid-1980s, there was a further expansion of the already excessive onshore processing capacity.

The debt load associated with excessive plant capacity combined with the general economic downturn in the recession of the early 1980s to bring the large vertically integrated companies heavily reliant on groundfish to the brink of financial collapse. This led to the Task Force on Atlantic Fisheries in 1982 and the financial restructuring of the four major processors in 1983. See Boom and Bust - Riding the Roller Coaster in Chapter VI, sections 5.2.6 and 5.2.7.

Because foreigners (with the exception of France) had already been phased out of the Gulf of St. Lawrence, Newfoundland and Nova Scotia were the major beneficiaries of the 200-mile zone in terms of greater resource availability because of the displacement of foreign fishing effort. It was off their coasts that the greatest stock recovery was anticipated. This led in the post-extension era to interprovincial bickering. Pressure from the Gulf provinces of Quebec, Prince Edward Island and Nova Scotia led to the virtual displacement of large trawlers based in Newfoundland and Nova Scotia from the Gulf. By the late 1980s the Gulf

provinces, through the Nova Nord consortium, were seeking increased access to the resources of the 200-mile zone.

5. DEVELOPMENT OF CANADIAN FISHERIES IN AREAS AND FOR SPECIES NOT PREVIOUSLY UTILIZED BY CANADA

5.1 Immediate Resource Supply Problems Post-Extension

The question of resource scarcity became a pressing management issue in 1976 with the imposition by Canada of the first TAC for redfish in the Gulf of St. Lawrence. This was established at a very low level in relation to previous catches and resulted in a substantial reduction in the quantity of traditional groundfish species available to the Canadian offshore fleet. This, coupled with substantial reductions in ICNAF - set TACs for stocks on the Grand Banks and the Scotian Shelf, generated concern that there was insufficient quota available to the Canadian offshore fleet to enable it to operate on a year-round basis.

In June, 1976, Fisheries Minister Roméo LeBlanc announced a series of interim measures aimed at keeping the east coast trawler fleet operating for the balance of 1976 (DOE, 1976d). These measures included the following:

- a special financial allowance under the Temporary Assistance Program for groundfish catches made outside the Gulf of St. Lawrence by Gulf-based vessels;
- exploratory fishing projects for species which Canadian vessels had not traditionally fished, such as silver hake, mackerel, grenadier, squid, Scotian Shelf shrimp and redfish in "distant waters";
- assistance to defray increased costs for fishing for traditional species in new areas, for example,

fishing for cod and turbot in areas off northeast Newfoundland and Labrador[1]; and

- a monthly limit of 500,000 pounds of redfish and/or flounders per vessel for the major portion of the east coast.

At that time DFO scientists attempted to project the rate of recovery of different stocks based upon various assumptions. The Gulf redfish stock was at a low level and would not rebuild until the early 1980s (DOE, 1978a). The northern and southern Gulf cod stocks were anticipated to rebuild slowly. For those stocks, restrictive TACs had severely constrained existing fishing effort. Any increase in TACs as stocks rebuilt would be offset by an increase in catch rates and the normal activity of the existing fleet, with small boats tending to fish cod longer each year as catch rates returned to past levels. Overall, there appeared to be a need to divert offshore effort out of the Gulf.

Some increases in catches and catch rates were anticipated for most traditional Scotian Shelf groundfish fisheries. It was expected that these improvements would allow for any increase in effort levels beyond those expended in 1977, and absorb some effort displaced from the pollock or cod fisheries.

Special problems were foreseen for fleets and plants based at the Gulf entrance in Sydney Bight and on the southwest coast of Newfoundland (Burgeo and Gaultois), which at that time were supplied by relatively old side trawlers of limited range.

It was projected that the cod and flatfish stocks of the Grand Banks would increase over time under a F_{01} management regime. This of course predated the problem of overfishing of the straddling stocks outside 200 miles in the post-extension

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[1] This became the stimulus for the development of a Canadian offshore fishery for northern cod.

era. In 1976-77 it was thought that the groundfish fisheries of the Grand Banks provided some hope for expansion of Canadian effort in the long-run.

Off northeast Newfoundland and Labrador, the dominant stock is the northern cod stock (Divisions 2J3KL). It was projected that the biomass of this stock would increase under Canadian management and that the TAC would increase significantly over the next several years, perhaps to 350,000 tons by the mid to late 1980s[2]. Until the bubble of anticipation burst in February 1989 with a scientific reassessment of the rate of increase in stock biomass in the 1980s, expectations ran high about the potential catches to be harvested from this stock on a long-term basis. Even as late as 1986-87, it was thought that the rebuilt stock could support catches at $F_{0.1}$ in the order of 300,000 tons per year.

Thus prospects for the major groundfish fisheries of the Atlantic coast were categorized as follows:

1. Slow Growth: The Gulf, Scotian Shelf and Grand Banks;
2. Decline: Fisheries of the Gulf Entrance; and
3. Sustainable Growth: Cod stocks of *northeastern Newfoundland*.

In the short-term, this resource availability imbalance appeared to necessitate a dramatic shift in the fishing strategy of the Canadian offshore trawler fleet. To achieve this, federal managers developed a plan to apportion the available stocks among the various components of the offshore trawler fleet with the objective of keeping trawler fleets and processing plants operating year round in 1977. The Atlantic Groundfish Management Plan for 1977 was the first attempt in Atlantic Canada to allocate or distribute stocks within an

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2 This stock did increase substantially in abundance in the post-extension era but not to the levels expected (Lear and Parsons, In Press).

overall TAC. It was developed by a working group of federal officials, following consultations with industry.

In the Gulf the Plan provided for the Canadian trawler fleet a potential catch of 80,000 tons in 1977 compared to an actual 1975 catch of 125,000 tons, a decrease of 36 percent. On the Scotian Shelf TACs had been decreased substantially in the 4VsW cod stock (from 30,000 to 7,000 tons) and in the transboundary pollock stock (from 55,000 to 30,000 tons). This, combined with the decline in TACs for groundfish in the Gulf where Nova Scotia-based trawlers had in the early 1970s taken a high proportion of their catch, meant that the total groundfish available to this fleet in traditional areas would be about 40 percent less than their 1975 catches.

For most of the groundfish species traditionally harvested by Canadians on the Grand Banks, St. Pierre Bank and in areas east and north of Newfoundland, the Canadian quota allocations had either stayed about the same or shown an increase. The Canadian quotas off Newfoundland and Labrador in 1977 were 261,000 tons compared with 1976 quotas of 232,000 tons and compared with 1975 catches of 148,000 tons for the same stocks. This major difference between catches and allocations was in large measure due to higher redfish allocations in areas not normally fished by the Canadian fleet and higher allocations of species not usually taken by the Canadian fleet in directed fisheries (e.g. turbot).

In summary, Canada's 1977 groundfish allocations under ICNAF totalled almost the same as in 1976; this was significantly less than in earlier years. Considerable quantities of potential catch had been lost off Nova Scotia and in the Gulf from stocks which the Canadian trawler fleet had demonstrated the ability to harvest. These losses had been made up in the form of redfish to the extent that the overall quantity of redfish available in 1977 was slightly higher than that available in 1976. But the harvesting of

these quotas would necessitate an overall northward shift in fishing activity by the Canadian offshore trawler fleet.

Thus, as groundfish fishermen and fisheries managers on the Atlantic contemplated the advent of the 200-mile fisheries limit, they faced the question of how to distribute the available resource among the competing interest groups. Unless the total pie, the sum of the TACs for particular stocks, was divided up among these fleet sectors, the offshore trawler fleet would harvest many of the available Canadian quotas in the Gulf and on the Scotian Shelf before inshore fishermen even got a chance to take to the sea in their small boats.

5.2 Attempts to Encourage Fishing for Nontraditional Species and in Nontraditional Areas

Attempting to balance these conflicting interests, the first Groundfish Plan provided incentives to encourage offshore trawlers to fish northern cod in the winter months. Approximately $4.5 million was provided to encourage fishing in northern areas, fishing of redfish and turbot, and fishing of underutilized quotas in traditional areas. This incentive program fostered the development of an offshore Canadian fishery for northern cod. When the incentive program was being developed, one prominent fishing company executive remarked: "The feds are crazy if they think Canadian trawlers are ever going to be successful in fishing northern cod during the winter in the ice!" This indicated the resistance of the Canadian industry to change.

Overall, the first Groundfish Plan addressed the problem of resource shortage in the Gulf by pushing the more mobile Nova Scotia and Newfoundland-based trawler fleets out of the Gulf and providing incentives to the Gulf-based offshore trawler fleet to fish outside the Gulf. The Plan also attempted to provide for the perceived lack of mobility of the side trawlers and lower-powered stern trawlers based in Cape

Breton and on the southwest coast of Newfoundland. These vessels were given preferential access to local resources while the larger stern trawlers were given financial incentives to fish for northern cod off Labrador and other species elsewhere in the Canadian 200-mile zone.

The displacement of the larger trawlers from the Gulf and the northward shift in allocations led to other distributional conflicts. The Nova-Scotia-based trawlers had traditionally exploited stocks on Georges Bank, the Scotian Shelf and in the Gulf of St. Lawrence. The larger Newfoundland trawlers had become highly specialized in fishing flatfish on the Grand Banks. The Newfoundland interests became concerned that the Nova Scotia trawlers would start scooping up the flatfish quotas. There was also growing concern that the Nova Scotians would start fishing northern cod intensively, leading to a redistribution of "Newfoundland" fish to Nova Scotian plants. This presaged a major interprovincial conflict which played a key role in the outcome of the 1980-1981 constitutional discussions pertaining to fisheries.

5.3 The Northern Cod Story

Much of the debate over groundfish resource allocation in the years from 1977 to 1990 focused on the northern cod stock off northeastern Newfoundland and Labrador. This stock, which is fished on the offshore banks during the winter as the fish congregate prior to spawning, migrates inshore during the late spring-early summer to feed and is caught by fixed gear, particularly cod traps. Historically, the northern cod stock was the basis for settlement of the coast of eastern Newfoundland and Labrador and continues to be the main support of hundreds of coastal communities in that area. These communities suffered great hardship as a result of the build-up of the foreign fleets and overfishing during the 1960s and early 1970s with the inshore cod catch declining from close to 200,000 tons in the 1950s to only 34,000 tons in 1974 (Figure

5-6). Up to that time, there had been very limited fishing of this stock by the Canadian trawler fleet (up to 20,000 tons in one year, when the foreign fishery was at its peak). Following extension of fisheries jurisdiction the federal government undertook a conservative approach to the management of this cod stock in order to rebuild the inshore fishery in this area.

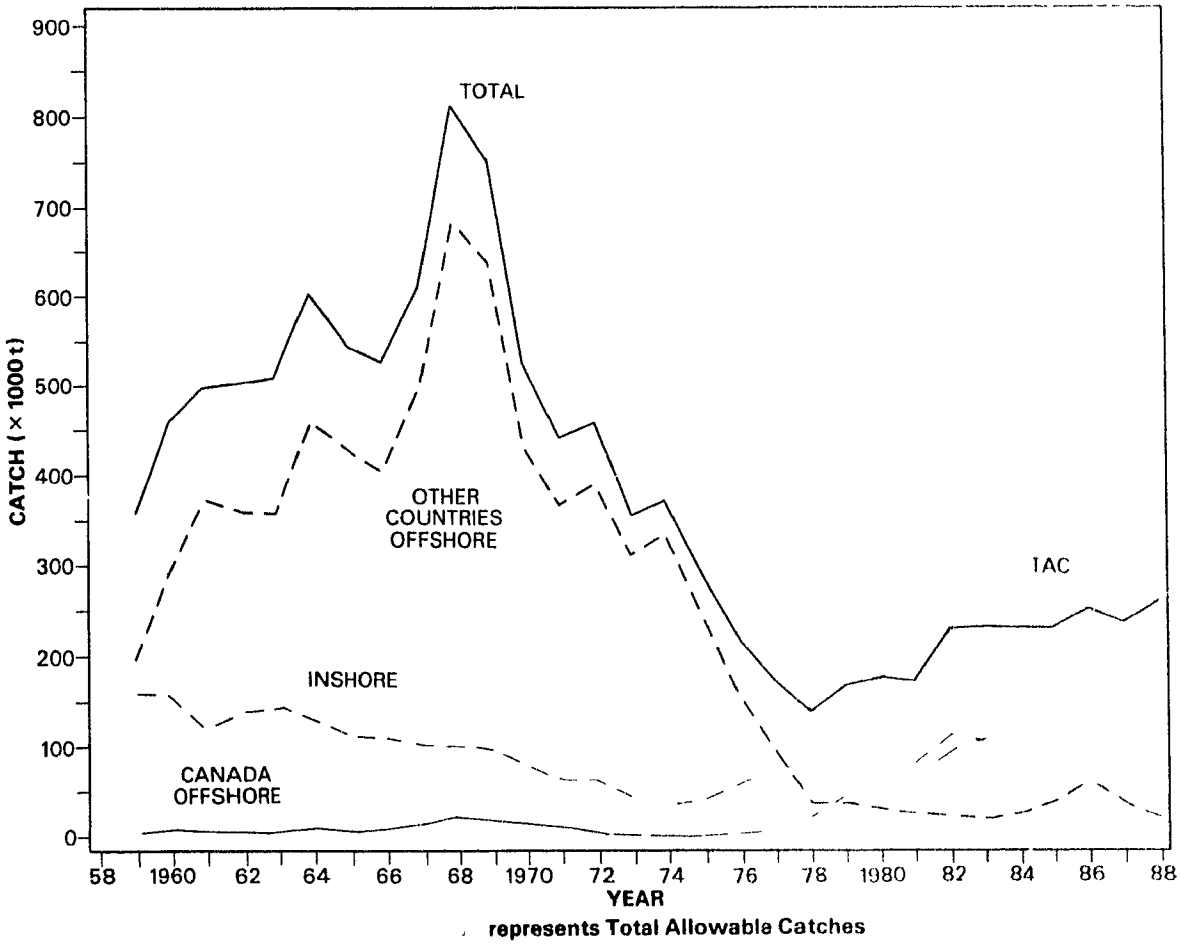
Under a more conservative TAC regime established by Canada, the stock began to increase in abundance after 1977. Catch rates in the winter offshore fishery increased very significantly. When Canadian trawlers began to fish this stock offshore in 1976 and 1977 with the assistance of federal subsidies and grants under the Groundfish Vessel Dislocation Program and the Northern Fishery Incentive Program, both Newfoundland - and Maritimes-based vessels participated. Inshore catches increased from 34,000 tons in 1974 to about 90,000 tons in 1979. Catches by the Canadian offshore fleet increased from 1,000 tons in 1975 to 45,000 tons in 1980, with Newfoundland-based offshore vessels catching 82 percent of the offshore total and Maritimes-based vessels 18 percent.

Public debate about access to the rebuilding northern cod stock began to escalate with the different interest groups attempting to obtain the largest share of the increasing TAC. Given the great social and economic importance of this fishery, the Minister of Fisheries decided to convene a major government/industry seminar on northern cod, which was held in Corner Brook, Newfoundland in August 1979, with representatives of the provincial governments and the inshore and offshore fleets as participants.

One month after the Seminar the federal government set forth its position in a discussion paper entitled Toward a Policy for the Utilization of Northern Cod. In summary, the policy for northern cod management consisted of the following elements:

Fig. 5.6 Trends in catches of northern cod 1960-1988
□ represents Total Allowable Catches.

Source: DFO, ICNAF and NAFO Statistics



represents Total Allowable Catches

"(a) The first and over-riding priority in allocations is to the inshore fishery. The consensus from the seminar participants was that two-thirds of the TAC of northern cod should be set aside as an allowance for the inshore fishery;

"(b) There must be some control on the number of units in the inshore fishery; and

"(c) An amount not to exceed 10 percent of the TAC of northern cod or alternatively an amount of 20 to 30 thousand tons should be set aside for negotiating, through NAFO, a larger allocation to Canada of fish beyond the 200-mile zone. As the offshore fleet will be the principal beneficiary, this amount should come from the offshore allocation. The domestic offshore allocation would thus approximate 25 percent of the TAC." (DFO, 1979)

For 1980, the TAC for northern cod was set at 180,000 tons, with a Canadian quota of 155,000 tons, of which 45,000 tons was allocated to the offshore fleet and 110,000 tons set aside as an "inshore allowance." For 1981, the TAC was increased to 200,000 tons, with a Canadian quota of 200,000 tons, of which 62,500 tons was allocated to the offshore fleet and the amount set aside for the inshore fishery was increased to 120,000 tons. Even though the effective "window" for the offshore fishery is probably only five months, the offshore fishery for northern cod increased until the mid-1980s.

The Task Force on Atlantic Fisheries devoted a chapter to the utilization of the Northern Cod Stock (Kirby, 1982). The Task Force assumed that the Canadian quota by 1987 would reach 380,000 tons. It proposed that the 1987 quota be allocated as follows. (Initial 1982 allocations are shown for comparison).

		1982	1987
1.	Inshore Allowance	120,000t	145,000t
2.	Existing trawler feet - vessels over 100 feet	87,250t	145,000t
3.	Resource-short plants	5,250t	50,000t
4.	Other fixed and mobile gear	2,500t	40,000t
		215,000t	380,000t

The Task Force proposed that a substantial proportion of the growth should be allocated to supply so-called Resource-Short Plants in the off-season and to support the development of a fleet of large "Scandinavian-type" longliners as an alternative to the small fixed gear vessels currently utilized in the inshore fishery. The intent of both the Resource Short-Plant Program and the fleet of longliners was to reduce the seasonality of processing activities along the northeast coast of Newfoundland.

Inshore catches which had reached 113,000 tons in 1982 subsequently declined to a low of 72,000 tons in 1986. Inshore fishermen argued that the declining inshore catch was the result of overfishing of the cod stock offshore by Canadian offshore trawlers within the Canadian fishing zone and foreign fishing vessels outside the 200-mile zone on the Nose of the Grand Banks.

Fisheries and Oceans Minister Tom Siddon in July 1987 appointed a Task Force headed by Dr. Lee Alverson to investigate the reasons for the decline in the inshore cod catches. The Alverson Task Force (Alverson, 1987) concluded that the decline in the inshore cod catch was the result of a combination of several factors:

1. Changes in availability resulting from predator/prey and/or environmental relationships, coupled with a slower than anticipated rebuilding of the major stocks;
2. Uneven distribution of fishing on stocks or components of offshore stocks migrating to inshore fishing grounds;

3. Potential over-fishing in the southern areas by the inshore fishermen of separate inshore stocks of cod;
4. Redeployment of effort to other target species;
5. Possible effects of fishing on recruitment; and
6. A slower growth rate of individual cod.

Inshore catches which had been decreasing from 1982 to 1986, increased slightly to 79,000 tons in 1987 and more significantly to 102,000 tons in 1988, the highest level since the previous peak of 113,000 tons in 1982. However, despite the increase in the inshore catches, there were some signs that the annual assessments had been overly optimistic. In January, 1989 CAFSAC concluded that the stock had recovered since the very low period of the late 1970s but at a slower rate than thought previously (CAFSAC, 1989). CAFSAC estimated that the fishing mortality in 1988 was probably about 0.44 and over the past several years had been between 0.4 and 0.5, considerably in excess of the $F_{0.1}$ level of 0.2. CAFSAC concluded that fishing in 1989 at $F_{0.1}$ would generate a catch of 125,000t. This implied a reduction in fishing effort by more than 50 percent.

Responding to the CAFSAC advice, Fisheries Minister Siddon on February 8, 1989, announced a downward revision of the 1989 TAC to 235,000t, a level which it was thought would stabilize the stock at its existing level. The Minister also announced the establishment of an independent review panel, headed by Dr. Leslie Harris, President of Memorial University.

The CAFSAC advice had shattered a decade of expectations and, if confirmed as accurate, posed an enormous dilemma for management of the northern cod stock. Thus a prudent verification of the assessment seemed warranted.

On May 15, 1989 the Independent Review Panel released an interim report (Harris, 1989). The Panel confirmed the CAFSAC reassessment of the northern cod stock and concluded that F

was somewhere in the range 0.35 to 0.55. The Panel recommended that the fishing mortality in 1990 be reduced to a level halfway between the existing level (0.45) and the $F_{0.1}$ level (0.20). This implied a TAC of 190,000t for 1990.

On January 2, 1990, Minister Siddon announced that the TAC was being reduced from 235,000t to 197,000t for 1990 (DFO, 1990a).

On March 30, 1990 the final report of the Independent Review Panel was released (Harris, 1990). The Panel recommended an immediate reduction of F to 0.30 and as early as possible to 0.20.

The socio-economic impacts of proposed reductions in the northern cod TAC were far reaching. The two major companies, Fishery Products International and National Sea Products, announced plant closures and vessel tie-ups. In response to the northern cod crisis and quota reductions elsewhere in the Atlantic, the government on May 7, 1990 announced a major Atlantic Fisheries Adjustment Program (AFAP) (Canada, 1990). This provided funding for expanded scientific research and enforcement, an industrial adjustment program for workers in communities facing plant closures, and a program to promote measures for community economic diversification.

The government chose not to reduce further the 1990 TAC because of the additional hardships it would produce. On December 14, 1990, Fisheries and Oceans Minister Valcourt announced a new multi-year Groundfish Plan (DFO, 1990b). This included a three-year program of provisional TACs for northern cod at 190,000t in 1991, 185,000t in 1992 and 180,000t in 1993. The inshore allowance was maintained at 115,000t for the three year period. The allocation of northern cod to the Resource Short Plant Program was eliminated.

Despite the problems experienced at the end of the 1980s, the development of a Canadian offshore fishery for northern cod was a non-traditional fishery for a traditional species

made possible by the displacement of foreign fishing effort in the post-extension era. There were other attempts on the Atlantic coast to develop fisheries for nontraditional species which met with little success until recently.

5.4 The use of Foreign Arrangements to Develop Fisheries for Other Species

Although one of the major objectives of Canadian fisheries policy post-extension was Canadianization of the fishery in the Canadian zone, there were species and stocks which the Canadian industry was temporarily not equipped to utilize given existing harvesting and processing technology and markets. To assist in the development of fisheries for such species and stocks, bridging mechanisms were considered necessary. These permitted the Canadian industry to test the technical and economic feasibility of new fisheries without having to make a premature commitment to substantial permanent investment, or provided temporary harvesting or processing capacity from foreign sources.

These various arrangements have been generally categorized as "foreign arrangements" or "cooperative arrangements". They included arrangements between Canadian fishing interests, be they government, company, union, fishermen's organization or private individual, and a foreign partner (government or state trading organization company or individual). The various types of arrangements utilized since 1977 fall into one of three general categories:

1. Developmental Charters;
2. Over-the-Side Sales (Direct Sales) and Over-the-Wharf Sales; and
3. The Resource-Short Plant Program (RSPP).

The latter two programs have been in existence throughout the period since extension in one form or another and have involved the use of foreign fishing vessels to either purchase

and process fish harvested by Canadian vessels or to harvest fish for delivery to Canadian processing plants.

5.4.1. Developmental Charters

Under the Developmental Charters program, a Canadian company could charter a foreign vessel to harvest an allocation of non-traditional species (particularly squid and silver hake). This was initiated in 1977 and continued in 1978 and 1979. It was recognized that new technology was required to harvest these non-traditional species. Questions as to methods of catching, type of gear to be used, handling of fish on board and freezing requirements needed to be answered. There was a perceived need to develop on-shore processing techniques, not solely as a technology transfer thrust, but also to obtain labour benefits and value-added benefits in the marketplace.

There appeared to be a major opportunity to develop a Canadian offshore squid fishery. In the late 1970s, squid, which exhibits cyclical fluctuations in abundance, was abundant off the Canadian east coast. There was at that time little Canadian experience in the harvesting, processing and marketing of squid, with the exception of a sporadic inshore fishery in Newfoundland. Canadian squid landings rose dramatically in 1977 (from 3,000 tons in 1975 to 38,000 tons in 1977). The bulk of 1977 landings (30,000 tons) was caught in the Newfoundland inshore fishery. About 8,000 tons was caught off Nova Scotia by foreign vessels for landing to and (theoretically) processing by Maritimes firms. In 1978 and 1979, allocations were made to various companies in Newfoundland and the Maritimes and permission given to enter into "charter" arrangements with foreign companies. In 1979, Canadian squid landings rose to 160,000 tons, effectively flooding the market and resulting in a build-up of inventories which lasted into 1980.

A limited version of the charter program continued in 1980. No charters of this nature were permitted from 1981 onward. The chief reason for discontinuing the program in 1980 was the conclusion that it had resulted in windfall products accruing to certain Canadian companies which had made no serious effort to gear up for handling this species. In any event, the offshore squid fishery off the Canadian Atlantic coast has been virtually non-existent since 1981 because of low resource abundance.

There have been other instances where genuine foreign charter arrangements were used as a transitional device to develop a Canadian fishery. One of the best examples was the development of the fishery for northern shrimp off Labrador. This fishery grew from zero in the mid - 1970s to a lucrative multi-million dollar fishery by the early 1980s. During the first year or two all Canadian licensees were permitted to charter foreign vessels to fish under Canadian licence. In the case of the three licences granted to Labrador based interests, this practice of "royalty charters" has been permitted to continue until the present time. Other new shrimp licensees have also been permitted to "charter" foreign vessels for an initial transition period.

5.4.2. Over-the-Side (Direct) Sales

The idea of using foreign vessels to assist in the development of the Canadian fishery commenced in 1976 with the first program of direct or over-the-side sales in the Bay of Fundy as part of the effort to convert the purse seine herring fishery from a meal fishery to a food fishery. As part of a broad array of initiatives, fishermen were permitted to sell 12,000 tons of unprocessed herring directly to Polish processing vessels at a price higher than Canadian buyers were prepared to pay.

In 1978, the direct sales concept was broadened on the Atlantic coast to species such as mackerel and squid. Since

that time over-the-side sales have been a continuing and, for a while extremely controversial, feature of the Atlantic fisheries scene. In the late 1970s over-the-side sales were also initiated on the west coast for Pacific hake.

With the exception of Atlantic herring and Pacific hake, the quantities involved have been generally small. Despite this, the subject of over-the-side sales became extremely controversial during 1979-81 on the Atlantic coast with processors contending that over-the-side sales were undermining the processing industry. In the late 1980s, an over-the-side program was worked out involving both fishermen and processors in an attempt to develop an expanded Canadian fishery for Atlantic mackerel, an underutilized species in Canadian waters.

One of the most successful and least controversial OSS sales programs in Canada has been that involving Pacific hake. Serious efforts to develop a Canadian Pacific hake fishery began in 1979 using over-the-side sales as a developmental mechanism. Experimental amounts of Pacific hake were brought to shore plants during a 1978 Canada - Poland cooperative arrangement. The Fisheries Association of B.C. agreed that shore processing of offshore hake stocks was not yet feasible, due primarily to low hake prices, high domestic labour costs and the difficulty of transporting hake to processing plants without critical loss of quality.

Organizations representing most of the groundfish processing industry in British Columbia formed a Pacific Hake Consortium to negotiate and coordinate over-the-side sales with foreign interests. Commencing in 1979, from a 35,000 ton TAC, 22,000 tons were set aside for this purpose. Each year thereafter the Hake Consortium negotiated over-the-side sales arrangements on behalf of B.C. fishermen. The USSR and Poland have been the dominant participants in the Pacific hake fishery. Japan became involved in 1988.

Landings increased from 5,191 tons in 1977 to 40,800 tons in 1983, the first year landings exceeded 40,000 tons. By 1988 landings reached 90,600 tons and the TAC for 1989 was established at 98,000 tons (Table 5-2). The amount allocated for foreign arrangements increased from about 30,000 tons in 1983 to about 53,000 tons in 1988.

Over-the-side sales played a key role in the development of a Canadian fishery for Pacific hake. This was clearly a successful use of foreign capacity to assist in Canadian fisheries development, due to a congruence of interest among Canadian processors, fishermen and foreign buyers. All parties, Canadians and foreigners alike, derived economic benefit from a nontraditional, highly perishable species that would have otherwise remained unharvested.

5.4.3. Resource - Short Plant Program (RSPP)

This program developed initially as a means of utilizing some northern cod for landing during the fall and winter at Newfoundland plants which would have otherwise operated only on a seasonal basis. In 1979, deliveries were made to plants in both Nova Scotia and Newfoundland. During 1980 to 1982, only Newfoundland plants were involved in the program. Subsequently, the concept of a Resource Short Plant Program was broadened to include other species not being fully utilized by Canadian vessels.

The use of foreign vessels to catch and land the fish at Canadian plants was an integral component of the program from its inception until the late 1980s. The Task Force on Atlantic Fisheries identified the seasonal peaking of the inshore catch as a major problem requiring substantial processing capacity which would be seriously underutilized in the off season (Kirby, 1982). The Task Force recommended that specific allocations from the growing northern cod stock be set aside for supplying resource short plants, particularly on the northeast coast of Newfoundland. The Task Force set out

Table 5.2 Total landings of Pacific hake by the foreign and domestic fisheries off British Columbia during 1977-1988 in metric tons.

	Country						
Year	**Canada**	**USSR**	**Japan**	**Poland**	**Korea**	**Greece**	**Total**
1977 National	-	2708	1931	552	-	-	5191
Joint Venture	-	-	-	-	-	-	
1978 National	-	700	3364	589	-	-	6467
Joint Venture	-	-	-	1814	-	-	
1979 National	320	-	3637	4263	-	-	12453
Joint Venture	-	1131	-	3102	-	-	
1980 National	96	78	817	4456	-	-	17662
Joint Venture	-	4300	-	4560	-	3355	
1981 National	4440	227	187	3189	-	-	25091
Joint Venture	-	7342	-	4779	-	4927	
1982 National	2	-	2237	10357	-	-	32209
Joint Venture	-	9391	-	10222	-	-	
1983 National	-	-	-	13177	-	-	40833
Joint Venture	-	14192	-	13464	-	-	
1984 National	-	-	-	13203	-	-	42109
Joint Venture	-	19692	-	9214	-	-	
1985 National	1192	-	-	10533	-	-	24962
Joint Venture	-	-	-	13194	-	-	
1986 National	1774	8138	-	15604	-	-	55352
Joint Venture	-	16642	-	13194	-	-	
1987 National	4633	11737	-	9716	-	-	74162
Joint Venture	-	18866	-	26347	2863	-	
1988 National	700	13330	-	26386	-	-	90599
Joint Venture	-	22819	1050	26314	-	-	

Source: B. Foulds Operations Directorate, Pacific and Freshwater Fisheries, Ottawa

some general parameters. It suggested that 10,000 tons of northern cod in 1983, increasing to 50,000 tons by 1987, as well as quantities of certain other species, be delivered to the plants by a self-financing fishing company or consortium.

Following extensive consultation during 1983, Fisheries Minister, Pierre de Bané announced on December 8, 1983, that the RSPP would be implemented early in 1984. A total of 11,000 tons of cod, 7,900 tons of redfish, and 8,000 tons of turbot was set aside for 1984. Some 60 processing plants were eligible to participate in the program. The Minister stated that Canadian offshore fishing vessels owners would be given first opportunity to catch the entire allocation. If processing plants were unable to secure the services of a sufficient number of Canadian fishing vessels, foreign-owned vessels would be permitted to participate in the RSPP program to a maximum of 50 percent of the total RSPP allocation in 1984 (DFO, 1983a).

In January, 1984, Minister de Bané made an arrangement with Portugal whereby the Portuguese would have first right of refusal on the foreign component of the program. The arrangement struck for 1984 involved 5,000 tons of northern cod being landed by Canadian vessels and 5,000 tons by Portuguese vessels. The entire foreign share was caught but some of the Canadian vessels were unable to deliver on their commitment. It was decided in the fall to allow the use of foreign vessels to harvest the remaining 2,600 tons of cod and 4,000 tons of turbot, on the basis that all of the landings would be 100 percent processed in Canadian plants.

The use of foreign vessels was intended to be phased down. The 1984 experience indicated that Canadian vessels were not available during the winter months to land 50 percent of the 10,000 tons of RSPP cod. It appeared likely that the problem of non-availability of Canadian vessels would become more severe if the northern cod RSPP allocations were to increase.

By 1987, two industry consortia of eligible resource-short plants - Newfound Resources Ltd. for the Newfoundland - based plants and Marque Resources Ltd. for plants in the Maritimes and Quebec - were in operation. The original criteria for 1987 called for harvesting of the RSPP quotas by Canadian vessels only. On September 30, 1987, the Honourable John Crosbie, announced, on behalf of the Minister of Fisheries and Oceans, that as "an interim measure aimed at ensuring the full utilization of the Resource - Short Plant Program during the remainder of the 1987 season", the two consortia were authorized to engage foreign - flag vessels to harvest the remaining 1987 RSPP quotas (DFO, 1987b).

The three-year agreements with Newfound Resources and Marque Resources expired at the end of 1988. On December 30, 1988, Fisheries Minister Siddon announced that the agreement with Newfound Resources would be renewed for a three year period because this consortium was (finally) Canadianizing its harvesting operation. The Newfoundland-based consortium was acquiring its own vessel. Minister Siddon stated the agreement with Marque Resources would be renewed for one year and only on the condition that the consortium submitted a harvesting plan using Canadian vessels (DFO, 1988a).

Thus more than 10 years after the first ad hoc program was authorized for the use of foreign vessels to catch and land northern cod at Newfoundland seasonal plants, it appeared that a Canadian capacity would be put in place to supply offshore fish, particularly northern cod, to these plants on a continuing basis. The Resource - Short Plant Program had evolved considerably over that time. The landings under this program were beneficial in fostering the viability of these plants, and were particularly helpful during years of a poor inshore fishery during part of the 1980s. While the Canadianization objective had been a target from the beginning, it was not easily achieved.

Unfortunately, the otherwise bright prospects for the Newfoundland consortium of Resource-Short Plants were considerably dampened by the revised scientific advice for northern cod for 1989. This program had been developed on the basis of expectations that perhaps as much as 50,000 tons of northern cod would be available for Resource-Short Plants by 1987. This was not to be the case.

With the reductions in the northern cod TAC in 1989, 1990 and 1991, the northern cod allocation to the RSPP was first reduced and then in 1991 eliminated. While the allocations of other species continued, the loss of the northern cod allocation removed an essential underpinning of the program.

5.4.4. Impact of the Foreign Arrangements Programs

Foreign arrangements, while often controversial, played a much smaller role in the development of the Canadian fishery post-extension than had been originally envisaged. The two major programs-direct sales and the RSPP had some beneficial impacts but these have been largely unquantified. Clearly, direct sales were instrumental in maintaining the viability of the Bay of Fundy herring fishery in the face of market fluctuations. Direct sales also assisted the development of a Canadian fishery for Pacific hake.

The RSPP had the potential to extend the operating period of formerly seasonal plants in northeast Newfoundland and underpin the processing capacity necessary to handle the seasonal peak in inshore catches. By the late 1980s it appeared that this program was on the way toward achieving the original program objectives, with a Canadianized harvesting capacity, in Newfoundland. The loss of the northern cod allocation in 1991 threatened the continued viability of this program.

Overall, foreign arrangements were a much less significant component of Canada's efforts to Canadianize the fisheries in its 200-mile zone than, for example, so-called

"joint ventures" in fostering the Americanization of the Gulf of Alaska pollock fishery.

6. COSTS AND BENEFITS OF EXTENDED JURISDICTION

Doubleday *et al* (1989) attempted a rough quantification of the direct costs of management and a qualitative indication of some of the benefits to Canada of extended jurisdiction on the Atlantic coast. They estimated an approximate total annual expenditure directly related to managing the Atlantic zone of extended fisheries jurisdiction of about $65 million in 1984. After allowance for overheads and excluding unrelated programs, the annual cost of managing the zone of extended fisheries jurisdiction on the Atlantic coast was estimated to be about $75 million Canadian in 1984, representing an increase of about $45 million 1984 dollars over pre-extension program costs. (The pre-extension base in 1978 dollars was $20 million for surveillance and enforcement and research annually in the area subject to extended fisheries jurisdiction, corresponding to a 1984 total of about $30 million).

Quantification of the net benefits of the fisheries management program in the 200-mile zone is, of course, exceedingly difficult. Doubleday *et al* (1989) suggested that, to a significant degree, the increase in catch rates and groundfish catches within the Canadian 200-mile zone could be attributed to the program of management. They noted increases to 1984 of 300,000 tons in Canadian Atlantic catches with a landed value of $100 million. Employment in harvesting had increased from 41,000 to 53,000 and in processing from 15,000 to 22,000. They also noted the beneficial impact of the increase in catch per unit effort of Canadian trawlers.

Overall, Doubleday *et al* (1989) concluded that extended jurisdiction had made it possible to stabilize and increase employment and to make some contribution towards reducing the costs of harvesting. It had not overcome structural problems

in the fishing industry and the Atlantic coast regional economy generally. This left the fishing industry very vulnerable to the twin forces of inflation and high interest rates in the early 1980s (see Chapter VI, section 5.2.6). Despite this, the authors concluded that the benefits of extended fisheries jurisdiction in Atlantic Canada had been "real and substantial and justify the expenditures needed to achieve them."

Since 1984 there have been some changes in the expenditures on various aspects of the fisheries management program in Canada's 200-mile fisheries zone. Although general expenditure reductions have been implemented in some programs of the Department of Fisheries and Oceans, significant increases in program resources were allocated to offshore surveillance and enforcement and some areas of research (e.g. northern cod) as a result of the Atlantic Fisheries Adjustment Program in May 1990 (see Chapter VI, section 5.2.8.3).

I have made no attempt to quantify the net benefits based on this later data because of the same difficulties faced by Doubleday *et al* (1989).

7. CONCLUSION

The 200-mile fisheries zone brought the bulk of the fisheries resources off Canada's coasts under Canadian fisheries management in 1977. This provided Canada with the authority to manage these resources in accordance with Canadian fisheries objectives. Canada gained considerable benefits by taking measures to rebuild depleted fish stocks and utilize the fisheries resources of the new zone.

In the decade following extension, Canada increased significantly its share of the allowable harvest off both the Atlantic and Pacific coasts. The presence of foreign vessels in the Canadian zone diminished dramatically in the 1980s as the quantity of fish allocated to other countries was reduced substantially.

The evolution of Canada's foreign allocations policy through three phases - Stability and Access for Markets, Reward for Past Performance, and Cooperation on Conservation - mirrored the changing circumstances influencing Canada's international fisheries policy. During the period 1977 to 1982, Canada's catches of valuable groundfish species such as cod increased substantially, leaving only nontraditional species available for allocation to foreign countries. With the possible exception of Portugal, Canada's attempts to secure improved market access in return for allocations in the Canadian zone proved unsuccessful. The most explicit attempt to link allocations to market access was the Long Term Agreement with the European Community. This was quickly judged a failure, partly because initial implementation of the agreement by the Community frustrated the achievement of Canada's market objectives.

The Reward for Past Performance approach adopted in 1982-83 was only partially more successful. By 1986 Canada had decided to no longer link fish allocations to attempts to improve market access. By this time Canada's attempts to rebuild fish resources within the Canadian zone on the Atlantic coast were threatened by overfishing of the stocks straddling the 200-mile limit on the Nose and Tail of the Grand Banks.

The 200-mile fishing zone meant that, on both coasts, Canada now had sovereign rights to manage the resource. Instead of being an international common property, the resource became national common property. Canada moved on a variety of fronts to deal with the common property problem. The 200-mile zone increased resource availability to the Canadian fleet on the east coast through displacement of foreign fishing effort. It made it possible for Canada to put in place a conservative resource management regime aimed at stock rebuilding. It fostered the introduction of innovative new approaches such as enterprise allocations. It also

shifted the responsibility for success or failure in management squarely to the shoulders of Canada as the coastal state.

The 200-mile zone made possible a more effective resource management regime than existed formerly under the international commission approach, particularly ICNAF. Thus Canada gained greater security of supply. But it did not solve all of the problems of the fishing industry. Expectations were high at the time of extended jurisdiction; the future appeared full of promise. Fourteen years later it appears that some of these expectations have been dashed, others shattered. Following the crises of the early 1980s on both coasts, there dawned a realization that the 200-mile limit was not the answer to all of Canada's fisheries ills. But an upswing in industry fortunes in the mid and late 1980s again weakened the industry resolve to work with government to tackle fundamental problems which remain unresolved. These problems and constraints are addressed in the following chapters.

CHAPTER VI

ASSESSING THE IMPACT II - PROBLEMS AND CONSTRAINTS

1. INTRODUCTION

Although the 200-mile fisheries zone provided Canada with the opportunity to manage the fish resources off its coasts in accordance with national objectives, the benefits anticipated from extended jurisdiction have been only partially realized. In the post-extension era the fishing industry has continued to experience periodic upswings and downturns. Particular fisheries continue to alternate between boom and bust. Even in cases where the resource supply has increased as a result of a more conservation-oriented management regime, anticipated economic benefits have been dissipated by an inexorable tendency to overcapacity in both the harvesting and processing sectors of the industry.

Achievement of the full potential benefits from the 200-mile zone has been stymied by a number of factors. In this chapter I examine the problems and constraints which have contributed to continued instability in Canada's marine fisheries.

2. LIVING WITH RESOURCE VARIABILITY

Both before and after the implementation of Canada's 200-mile fisheries zone various fisheries have experienced relatively rapid surges of prosperity followed by equally rapid downturns. These surges are due to a number of factors, either acting in isolation or in combination. One of these is the often volatile nature of the resource base. Despite decades of scientific investigation, it is still not possible to predict with any reasonable degree of certainty long-term changes in resource abundance or resource availability. Such

changes can have a dramatic effect upon the year-to-year fortunes of fisheries for particular species.

Perhaps one of the most dramatic examples of this over the past several centuries has been the periodic "failure" of the inshore cod fishery along northeast Newfoundland and Labrador. Long before the advent of offshore trawling for northern cod, the inshore fishery was plagued by substantial variability in inshore catches (Figure 6-1). While this variability was sometimes enhanced by changes in fishing effort, for example, during the two world wars, there has been an underlying variability in availability of this cod stock to inshore fishing gear. This has persisted to the present day. This fishery continues to alternate between years of feast and years of famine.

Dramatic year-to-year fluctuations in resource abundance have shaped the development and decline of other fisheries. On the east coast, two prominent examples pre-extension were the development of large-scale fisheries for redfish in the Gulf of St. Lawrence in the late 1960s and early 1970s and the purse seine fishery for southern Gulf herring almost coincidentally. Since its inception in the 1950s the Gulf redfish fishery has been dependent upon very few, infrequent large year-classes. The largest of these were the year-classes of 1956 and 1958 which sustained a dramatic expansion of the Gulf redfish fishery from less than 10,000 tons in the early 1950s to 130,000 tons in 1973, followed by a sharp downturn to less than 20,000 tons in the late 1970s (Figure 6-2). Subsequently, the fishery recovered in the 1980s to the 30,000 - 40,000 ton -range based upon moderately successful year-classes of the early 1970s. For a period of about 10 years, the Gulf redfish fishery provided the main resource supply for certain plants on the south coast of Newfoundland and in Nova Scotia. Following the near-collapse of this fishery in the mid-1970s, the Canadian offshore trawlers which

Fig. 6.1 Variability in inshore catches of northern cod.

Source: DFO Statistics, St. John's, Newfoundland

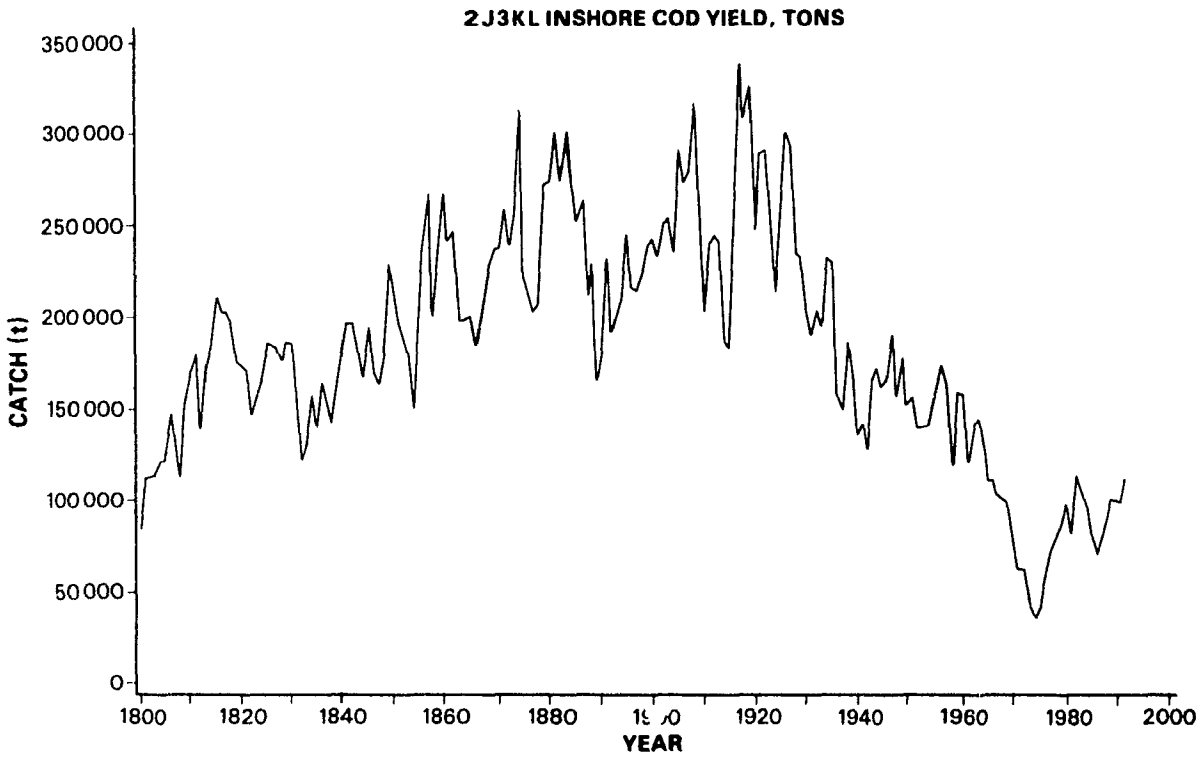
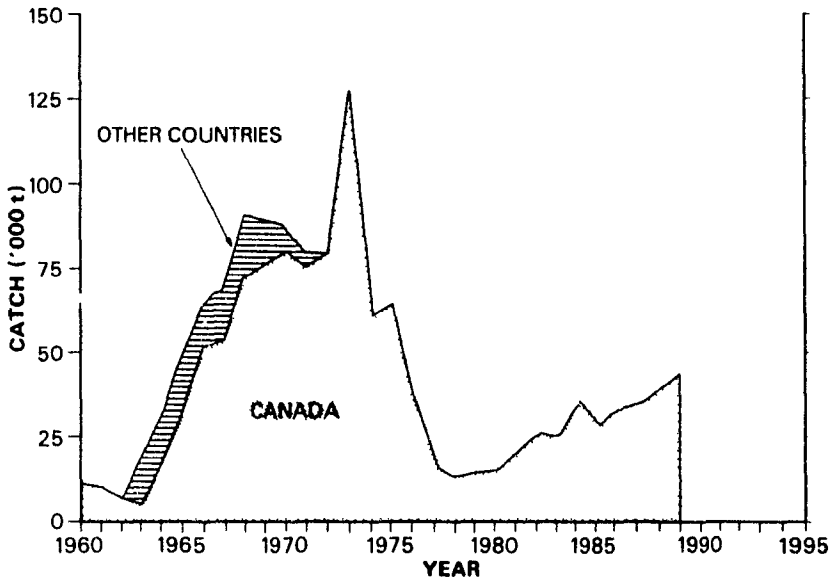

2J3KL INSHORE COD YIELD, TONS
350 000
300 000
250 000
200 000
150 000
100 000
50 000
0
CATCH (t)
1800
1820
1840
1860
1880
1900
1920
1940
1960
1980
2000
YEAR

Fig. 6.2 Redfish catches in the Gulf of St. Lawrence 1960-1989.

Source: DFO Statistics, Ottawa


150
125
100
75
50
25
0
CATCH ('000 t)
OTHER COUNTRIES
CANADA
1960
1965
1970
1975
1980
1985
1990
1995
YEAR

had fished this stock began to direct their efforts to new species and/or areas. It was during this period that Canadian trawlers began to fish northern cod during the winter off northeast Newfoundland and Labrador, with government financial assistance under the Groundfish Vessel Dislocation Program.

Similarly, a purse seine fishery for southern Gulf herring developed rapidly in the late 1960s, based upon the large 1958 year-class of autumn spawners and the 1959 year-class of spring spawners. The federal and provincial governments encouraged the development of this fishery following the closure of the B.C. herring fishery in 1967. Some purse seiners from British Columbia moved to the Atlantic coast to fish herring in the southern Gulf, along southwest Newfoundland and in the Bay of Fundy. The boom in the southern Gulf-southwest Newfoundland fishery lasted 5 to 6 years followed by a collapse in the early 1970s after the fishing down of the two large year classes. Since that time this fishery has fluctuated on a smaller scale (Figure 6-3).

On the Pacific coast, the valuable Pacific salmon fishery has been characterized by considerable variability in landings with pronounced peaks and troughs over the past 45 years (Figure 6-4). Given the complexity of this fishery for five species and the differing cycles of abundance of the five species, the downturn in the fishery for some species is sometimes masked by the upswing in the abundance of other species. Landings have varied from 90,000 tons in 1951 down to 34,000 tons by 1960, up to 74,000 tons in 1962, back down to 41,000 tons in 1965 and so forth. Landings were 50,000 tons in 1984 and 100,000 tons in 1985.

Landings of Pacific herring have also exhibited pronounced peaks and troughs (Figure 6-5). During the days of the purse seine fishery for reduction purposes, landings fluctuated from 180,000 tons in 1950 to 86,000 tons in 1952, increased to 223,000 tons in 1956, dropped to 134,000 tons in

Fig. 6.3 Herring catches in the southern Gulf of St. Lawrence, 1960-1989.

Source: DFO Statistics, Ottawa

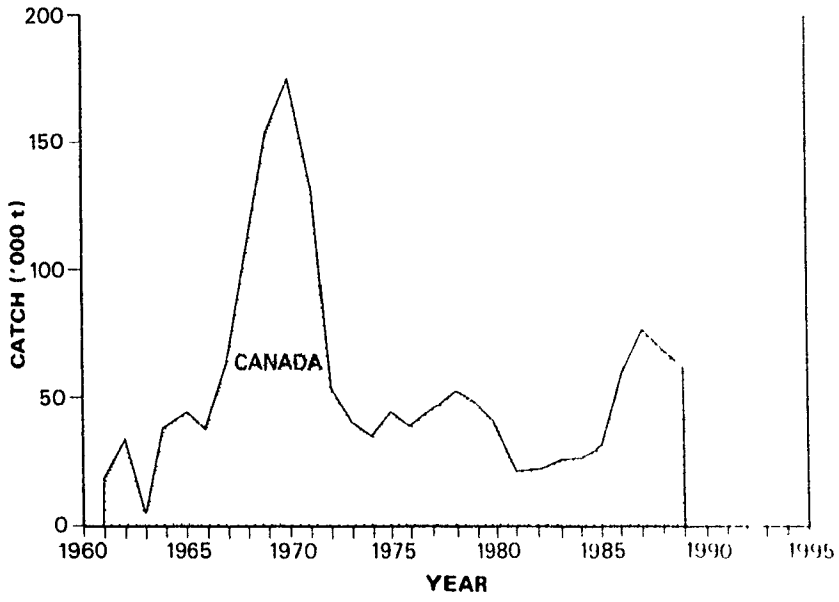

200
150
100
50
0
CATCH ('000 t)
CANADA
1960
1965
1970
1975
1980
1985
1990
1995
YEAR

Fig. 6.4 Landings and landed value of Pacific Salmon in British Columbia, 1950-1988.

Source: DFO Statistics, Ottawa

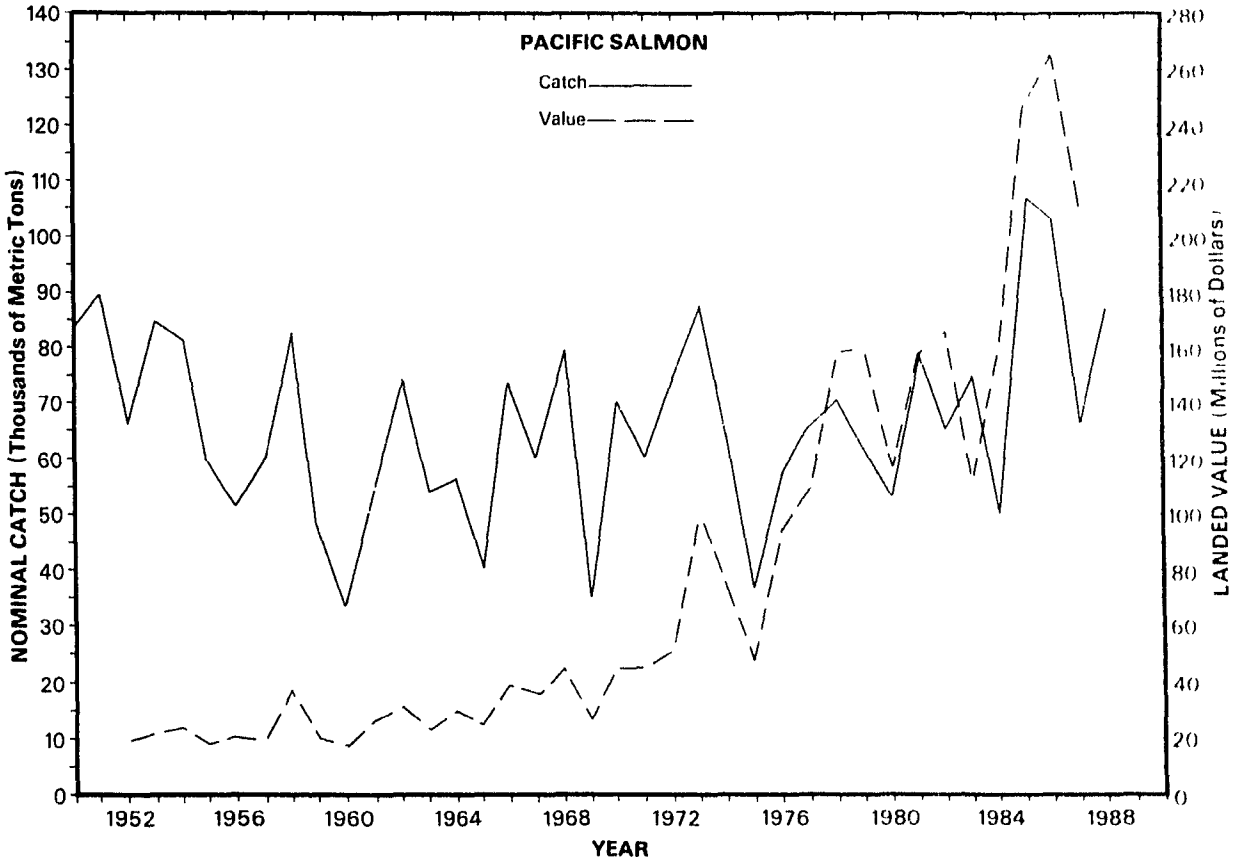
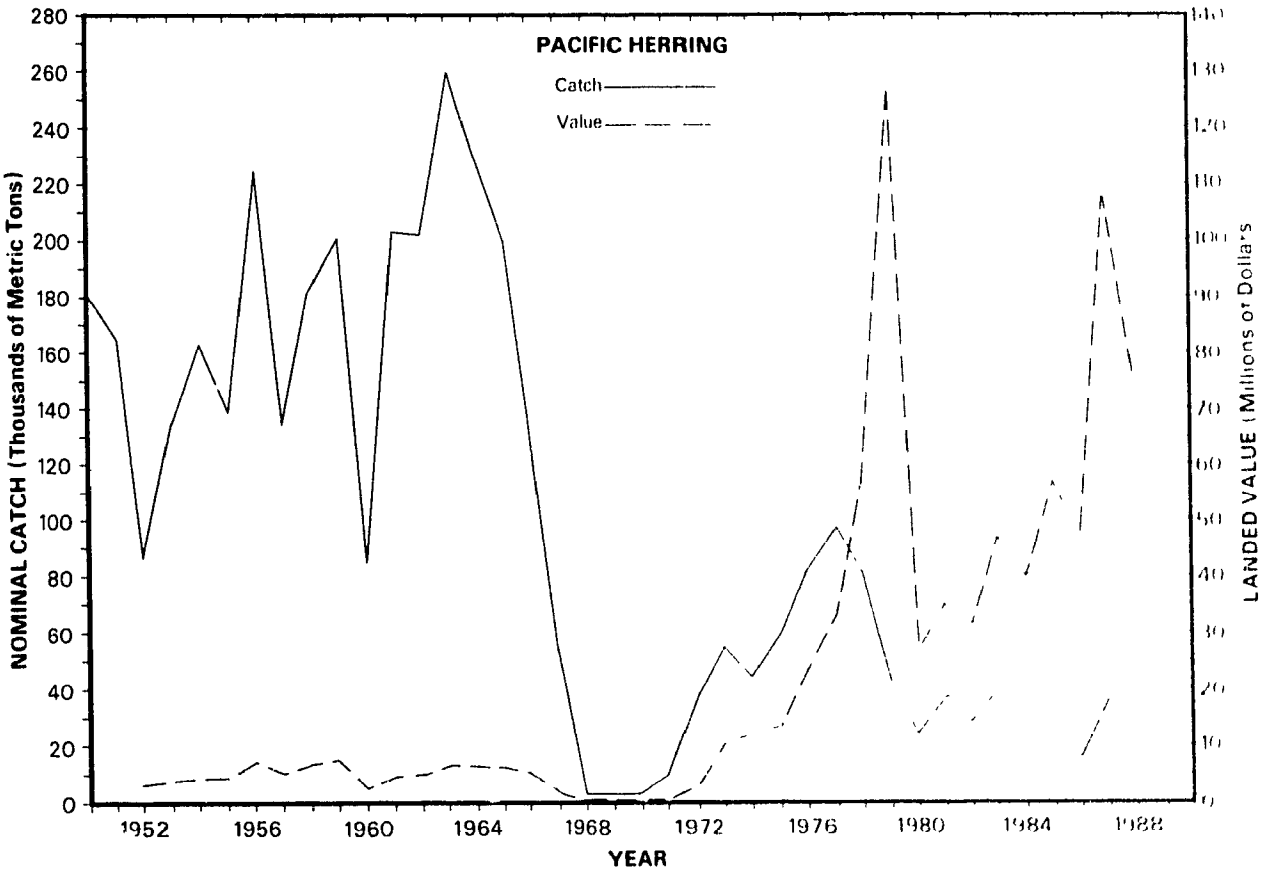

PACIFIC SALMON
Catch
Value
NOMINAL CATCH (Thousands of Metric Tons)
LANDED VALUE (Millions of Dollars)
YEAR
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988

Fig. 6.5 Landings and landed value of Pacific herring, in British Columbia, 1950-1988

Source: DFO Statistics, Ottawa


PACIFIC HERRING
Catch
Value
NOMINAL CATCH (Thousands of Metric Tons)
LANDED VALUE (Millions of Dollars
YEAR
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988

1957, increased again to 201,000 tons in 1959, dropped to 85,000 tons in 1960, increased to a peak of 259,000 tons in 1963 and dropped dramatically to 53,000 tons in 1967. The fishery was then closed because of concern about the state of the stocks. Following the re-opening of the fishery for food purposes in the early 1970s, landings again fluctuated, increasing to 97,000 tons in 1977 but dropping sharply to 25,000 tons by 1980. During the 1980s, landings fluctuated in the 25,000 to 40,000 ton range. The 1977 peak of 97,000 tons (since 1970) was associated with the so-called Klondike days of the Pacific roe-herring fishery.

Although complex mathematical models have been developed to describe the response of a fish population to fishing, natural variability can confound the attempts of fisheries scientists to use such models to provide advice on appropriate management strategies. The phenomenon of infrequent large year classes has been observed worldwide. Rothschild (1986) presented data on the ratio of maximum recruitment to minimum recruitment and the number of years per very large year class for various stocks (Table 6-1). He observed that most recruitment values are very low. These relatively low values are interspersed by the occurrence of very large year classes for the species considered. He concluded that the average interval between very large year classes is about eleven years.

Substantial interannual variability in recruitment is common in most marine fish stocks. The quest to unravel the mechanisms determining this interannual variability has bedeviled fisheries scientists since the turn of the century. There have been two broad approaches to the problem. One, which has been vigorously pursued since the work of Beverton and Holt (1957) and Ricker (1954, 1958) attempting to relate parental stock size and subsequent recruitment, has involved the fitting of models to existing data and the further development of models, both functional and empirical. The

Table 6.1 The Ratio of maximum recruitment to minimum recruitment and the number of years per very large year class (VLYC) for various stocks

Stock	Number of Years	Max. recruit $\times 10^6$	Min. recruit $\times 10^6$	Max / min	Number of VLYC	Years per VLYC
California sardine [a]	31	21,545	110	196	2	15
Norwegian spring-spawning herring [a]	20	78,300	600	130	2	10
North Sea Herring [a]	23	21,370	1,040	21 (10)	2	12
St Lawrence mackerel [a]	10	7,514	1,710	4	1	10
Arcto-Norwegian cod [a]	26	2,920	170	17	4	6
Greenland Cod [a]	20	718	7	100	2	10
St. Lawrence Cod [a]	25	214	62	3	4	6
North Sea haddock [a]	48	6,297	55	114	5	10
Georges Bank haddock [a]	27 (43)	283	23	12 (2,700)	1	27
North Sea plaice [a]	30	1,310	249	5	1	30
North Sea sole [a]	22	598	38	16	2	11
Northeast Arctic haddock [a]	26	1,540	30	50 (9)	4	6
Georges Bank cod [b]	14	-	-	2.5	1	14
North Sea cod [b]	15	-	-	5.5	3	5
Georges Bank herring [b]	15	-	-	5	2	7
North Sea mackerel [b]	10	-	-	41	1	10
Northwest Arctic mackerel [b]	12	-	-	18	1	12
North Sea saithe [b]	18	-	-	12	2	9
North Sea whiting [b]	16	-	-	7	4	4
South American pilchard [b]	16	-	-	10	2	8
South American anchovy [b]	13	-	-	3	3	4
Round herring [b]	13	-	-	10	1	13
Peruvian anchovy [b]	16	-	-	11	2	8
Silver hake [b]	19	-	-	10	1	19

a. From Garrod, 1982.
b From Hennemuth, Palmer, and Brown, 1982

Source: Rothschild, B.J. 1986. Dynamics of Marine Fish Populations

second approach has involved an attempt to understand the mechanisms determining interannual variability in recruitment.

There is a large volume of literature on this subject. Space precludes a thorough examination here. For recent reviews, see Rothschild (1986), Cushing (1988), Larkin (1989) and Wooster and Bailey (1989).

Johan Hjort vividly demonstrated the existence of year-class variability by tracing the large 1904 year-class of Norwegian herring through the fishery (Hjort 1914). Hjort proposed two hypotheses to account for recruitment variability. His first hypothesis stated that variability in year-class size is a result of between-year shifts in the precise timing of spawning and of the phytoplankton bloom, which initiates the seasonal zooplankton cycle upon which fish larvae feed. Laboratory studies had indicated that first feeding during the few days following final resorption of the yolk sac were critical to larval survival.

Hjort's second hypothesis suggested that interannual differences in the advection of eggs and larvae away from appropriate geographic areas for feeding and life cycle continuity generated subsequent recruitment variability.

Sinclair (1988a) suggested that the period from 1914 to 1948 represented a firming up of these concepts in terms of understanding fluctuations in landings in marine fisheries as a problem of population regulation (see also Sinclair and Solemdal 1988). There was no real field testing of these hypotheses during that period.

Stock-recruitment relationships expressed as mathematical models came to prominence in fisheries biology in the mid-1950s with the work of Ricker and Beverton and Holt. In subsequent decades there have been numerous attempts to fit various forms of these models to data on recruitment and stock size for numerous fish populations, with varying degrees of success. Generally there was such a wide scatter that it was not possible to distinguish between the validity of various

models or indeed whether there was really any clear evidence of a particular stock-recruitment relationship.

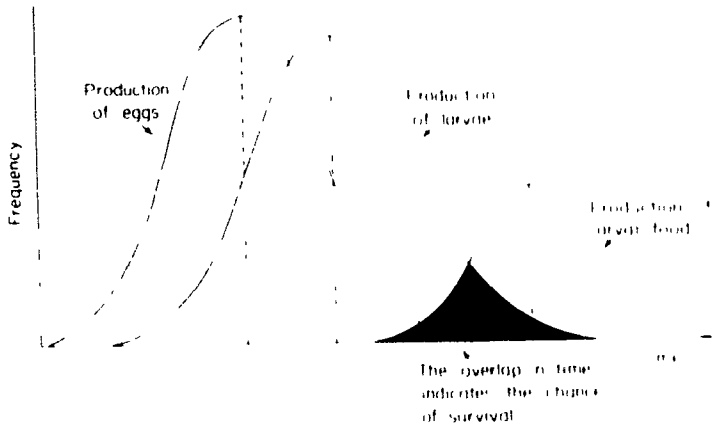
Two other key contributions were the work of R. Harden-Jones (1968) in his book Fish Migration and that of David Cushing summarized in a series of papers and his book Marine Ecology and Fisheries (Cushing 1975). Harden-Jones considered events during the larval drift phase to be critical to determining variability in year-class size. Cushing (1975) developed the 'match-mismatch' theory. This theory linked Hjort's first hypothesis concerning the variability in timing of spawning and time of blooming with the "critical depth" concept of oceanographer Sverdrup (e.g. Sverdrup 1953).

Cushing hypothesized that the production of fish larvae was matched or mismatched to the production of their food in temperate seas. He suggested that fish spawn at a fixed season in order to maximize the chance of larval survival in the face of a highly variable time of onset of the production cycle. If the larval food production cycle is delayed, under this hypothesis recruitment to a fish stock would increase or decrease depending on whether it became matched or mismatched to the production cycle. The principle of the match-mismatch hypothesis is illustrated in Figure 6-6. Subsequently, food-chain events during the early larval drift phase became the focus of study, in a series of field studies on the first stages of the life cycle concerned with the first feeding of larvae.

During the 1960s and early 1970s there was the parallel development of explorations of the role of ocean climate, specifically large-scale changes in physical oceanographic processes, on recruitment fluctuations. Iles (1973) drew attention to correlations between year-class variability in the North Pacific and in western Canadian lakes and large-scale ocean climate changes. This followed on the heels of work during the 1950s and 1960s supporting the concept that changes in circulation in the egg and larval distributional

Fig. 6.6 Illustration of Cushing's match/mismatch hypothesis.

Source: Adapted from Cushing, D.H. 1982. Climate and Fisheries. Academic Press (Fig. 112. p. 303)


Frequency
Production of eggs
Production of larvae
The overlap in time indicates the chance of survival

areas were critical to the definition of year-class variability.

Cushing (1978) extended Iles's suggestion of the effect of global climatic variations on year-class variability. By the time of the ICES Symposium on Marine Ecosystems and Fisheries Oceanography in 1976 (Parsons *et al*, 1978) there was growing evidence linking oceanographic conditions to recruitment fluctuations. Among other studies, Lasker (1978) linked oceanographic conditions and larval anchovy food in the California Current, suggesting that the timing and duration of upwelling were crucial determinants for the survival of northern anchovy.

Sinclair (1988a) summarized the field studies on the recruitment question involving Canadian scientists during recent years. Most of the Canadian field studies on recruitment took place in the Atlantic. Two major initiatives were the ICNAF/NAFO-sponsored multinational studies on Georges Bank herring and Flemish Cap cod and redfish. For reviews of these studies, see Grosslein (1987), Lilly (1987) and Grosslein and Lilly (1987).

A third study, conducted between 1977 and 1982, was the Scotian Shelf Ichthyoplankton program (SSIP). The aim was to describe the seasonal distribution of eggs and larval distributions for all fish species on the Scotian Shelf, preparatory to a study on the recruitment dynamics of a particular population. The observations suggested persistence of egg and larval distributions for some species over the banks rather than drift with the residual surface layer circulation. The results set the stage for a follow-up recruitment study on Brown's Bank haddock.

Parallel to these three major expensive large scale field programs, two classes of inexpensive small-team studies were carried out in the Atlantic during the same period (Sinclair, 1988a). The first was a series of statistical studies initiated by W. Sutcliffe and his colleagues in the former

Marine Ecology Laboratory (MEL) in Dartmouth, Nova Scotia. These studies involved the analysis of data on year-class sizes (or landings) and physical oceanographic parameters. The second category included the near-shore field studies by William Leggett and his colleagues on the spawning and early life history of capelin in both the St. Lawrence Estuary and Newfoundland bays.

Meanwhile, during the 1980s new modelling approaches were applied to the stock and recruitment question (e.g. Garrod, 1982; Shepherd, 1982; Cushing, 1988; Evans and Rice, 1988; Sissenwine and Shepherd, 1987).

Various hypotheses advanced over recent decades envisage an important role for environmental variability in helping to determine variability in year-class strength of marine fish populations (e.g. Sinclair, 1988b). For Atlantic herring, Iles and Sinclair (1982) suggested that the richness of stocks of Atlantic herring is determined by the number of areas that are suitable for larval retention. Further, the abundance of a stock was considered to be determined by the size of its larval retention area.

Sinclair (1988b) and Sinclair and Iles (1989) extended this hypothesis to situate the recruitment problem as a component of the broader question of the regulation of animal populations. For marine fish species with complex life histories, they interpreted the specific patterns in spawning location and the associated numbers of populations as being a function of the requirement for coherence at the early life history stages in the face of the diffusive and advective characteristics of the oceans. They suggested an integrated conceptual framework within which both physical oceanographic and food-chain processes play a direct role in the regulation of abundance.

They suggested four aspects of populations may be relevant to the question of the regulation of abundance: spatial pattern, richness, absolute abundance, and temporal

variability (Figure 6-7). Spatial pattern was defined as the geographical distribution of self-sustaining populations of the same species. Population richness was defined as the number of discrete self-sustaining populations within a species. The range of absolute abundance between component populations of marine fish species may cover several orders of magnitude. The fourth characteristic is temporal variability of numbers within populations due to year-class variability. Sinclair and Iles argued that progress in understanding the causes of temporal variability in abundance within populations may be hindered by the lack of understanding of the processes regulating pattern, richness and absolute abundance.

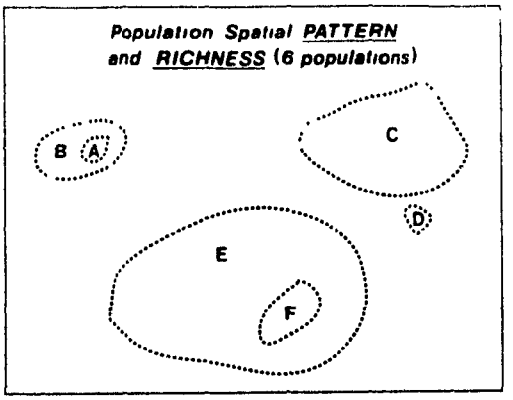
Sinclair and Iles proposed a population-regulation hypothesis (the member/vagrant hypothesis) to account for these four populations characteristics. This concept of the complex life histories of populations is shown in Figure 6-8. The member/vagrant hypothesis has three components:

1. Population pattern and richness are functions of the number and location of geographic settings (within the overall distributional area of the species) within which the particular life cycle is capable of closure.
2. Absolute abundance is scaled according to the size of the geographic area in which there is closure of the life cycle of the free-crossing population.
3. Temporal variability is a function of the integenerational losses of individuals (vagrancy and mortality) from the appropriate distributional area that will ensure membership within a given population.

Both density-dependent and density-independent factors are implicated in the member/vagrant hypothesis as it relates to the determination of temporal variability. Space precludes a full examination of this complex hypothesis. For more details, see Sinclair (1988b).

Fig. 6.7 Schematic representation of the four components of the population regulation question.

Source: Sinclair, M. 1988b. Marine Populations


Population Spatial PATTERN
and RICHNESS (6 populations)
A
B
C
D
E
F

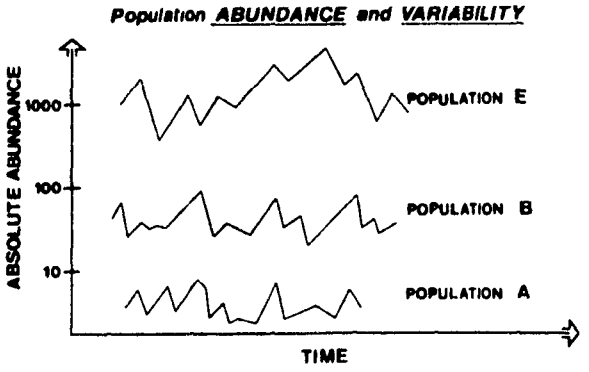
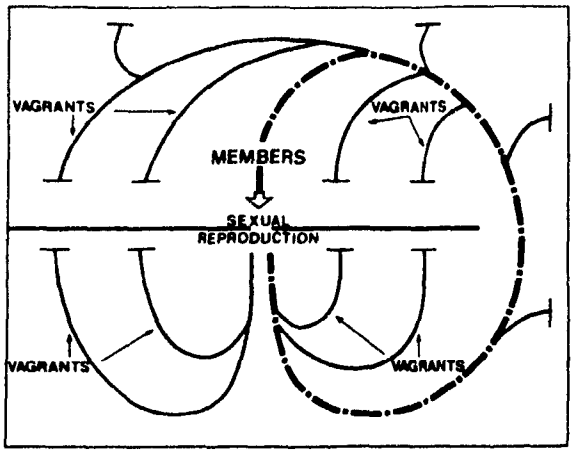

Population ABUNDANCE and VARIABILITY
ABSOLUTE ABUNDANCE
1000
100
10
POPULATION E
POPULATION B
POPULATION A
TIME

Fig. 6.8 Schematic representation of life cycle closure of a marine population with a complex life history in relation to spatial constraints.

Source: Sinclair, M. and T. D. Iles, 1989

Life Cycle Solution with
Particular Spatial Constraints



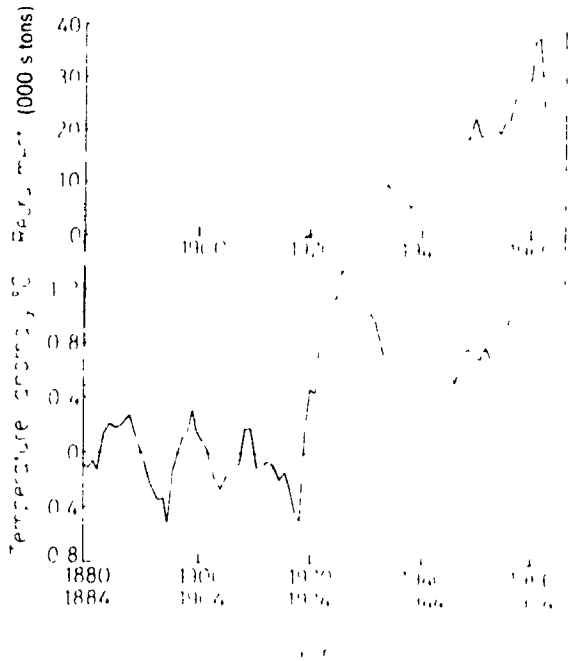
A number of other studies have emphasized the importance of environmental variability in determining recruitment. That climate affects fisheries has long been recognized. Cushing (1982) provided an extensive overview in his book Climate and Fisheries. In it he dealt briefly with the dependence of recruitment upon environmental factors. He cites a number of early studies correlating year-class strength to environmental variables - usually temperature. Both positive (e.g. Johansen, 1927; Dickie, 1955; Hermann *et al*, 1965) and negative correlations (Uda, 1952; Marr, 1960; Ketchen, 1956; Martin and Kohler, 1965; Dickson *et al*, 1973) have been shown between temperature and year-class strength. One of the more striking examples was the apparent dependence of recruitment to the West Greenland cod stock upon temperature (Hermann *et al*, 1965; Figure 6-9).

Not all of these relationships to temperature could be explained in the same way. Cushing (1982) suggested that differences in recruitment from year to year were affected by differences in wind strength and direction.

Templeman (1972) reviewed data on year-class success for the previous 30 years of most of the main stocks of cod and haddock in the North Atlantic. There appeared to be area relationships for year-class success of these species, between success of haddock on Georges and Browns Banks and of year-class success either of cod or haddock or both on Sable Island Bank, St. Pierre Bank, and the Grand Bank one year later or sometimes in the same year. Success in the Icelandic, Greenland and Norwegian-Spitzbergen-Barents Sea areas appeared to occur in the same year as but usually one year later than good year-classes in the Sable Island to southern Grand Bank area. Templeman suggested that some of the factors affecting year-class were: temperature but temperature by itself might be of secondary rather than of direct importance; larval drift in currents to unfavourable situations; mixtures of water by winds and currents, the resulting high plankton abundance

Fig. 6.9 Dependence of recruitment to the West Greenland cod stock upon temperature during the early years (Hermann *et al*, 1965).

Source: Cushing, D. H. 1982. Climate and Fisheries


(000 s tons)
40
30
20
10
0
0 8
0 4
0
0 4
0 8
1880
1884

being favourable. He also suggested that density dependent factors played a role.

Dunbar (1982) provided an overview of twentieth century marine climatic change in the Northwest Atlantic and Subarctic regions. All regions showed a rapid rise in temperature, strongest at the surface, from 1920 onwards. The peak temperatures in eastern Canadian waters occurred about 1950, some 10-20 years later than in Greenland and Iceland. A second peak occurred during the late 1950s to 1960 in Greenland and Iceland, but this was less marked in eastern Canadian marine waters. He suggested that the trend at that time (1982) was uncertain but that the general pattern on the longer (interglacial) time scale indicated a downward trend. The range of variation in temperature for all regions was, on the average, about 2° to 2.5°C. These observations were made in advance of the late 1980s concern about possible climatic change and global warming as a result of man's activities. As early as 1982, Dunbar suggested that such effects must be given urgent attention.

Shepherd *et al* (1984) acknowledged that major long-term changes of abundance and/or geographical range of fish populations could be attributed to the effects of climatic change. They suggested that environmental changes are likely to affect fish stocks via four principal processes:

1. Direct physiological effects;
2. Disease;
3. Feeding, with successful feeding being affected through:
    a) Food abundance;
    b) Food quality;
    c) Temporal match/mismatch of food production and feeding;
    d) Spatial distribution of food relative to fish;
    e) Local concentrations of food;

f) Competition; and

4. Predation.

Shepherd *et al* (1984) noted that each species of fish has its own unique set of relationships with environmental variables. A simple change in one environmental factor could produce a complex change in the web of competition and predation interactions between species that would be extremely difficult to predict.

Many relationships have been reported over the years between recruitment and various environmental factors. Examples of some of these are presented in Tables 6-2 and 6-3 from Shepherd *et al* (1984). Based on further analysis of the data from these studies, Shepherd *et al* (1984) concluded that there is strong evidence, from the long history of fluctuations of abundance and the existence of fairly well-defined geographical ranges, that an important relationship must exist between recruitment and climate. Specifically, they suggested that the correlation between North Sea stocks and temperature warranted further investigation. In addition, the relationship between various Pacific stocks and an index of upwelling on the California coast based on a larval transport mechanism (Bakun and Parrish, 1980) and that between several Northwest Atlantic stocks and run-offs in the St. Lawrence river, based also on a larval drift mechanism (Sutcliffe, 1972, 1973) also warranted further study.

Analyzing recruitment time series for 14 stocks of Northwest Atlantic fish, Koslow (1984), found consistent positive correlations in recruitment among stocks within such species as cod, haddock and herring. Significant positive correlations were also found in recruitment among demersal, offshore-spawning species (cod, haddock and redfish). Recruitment in these groups tended to be negatively correlated with that of pelagic species, which spawn inshore (herring) or

Table 6.2 Temperature as a recruitment factor

Species	Reference	Proposed mechanism	Hypothetical ultimate cause
Plaice	Bannister *et al.* (1976)	Reduction of predator nos. or whereabouts or food requirements of predators	
Atlanto-Scandian herring	Benko and Schverston (1971)		
North Sea plaice	Beverton and Lee (1965)	Duration of pelagic phase + drift	
Manx herring	Bowers and Brand (1973)		
Herring, East Anglian autumn fishery	Carruthers and Hodgson (1937)		
Arcto-Norwegian cod	Cushing (1972)	Match-mismatch	Changes in wind strength and direction
North Sea cod	Dickson *et al.* (1974)	Physiological effect of temperature on larval size, density dependence, ability of larvae to consume food, Match-mismatch	
West Greenland cod	Dunbar (1968)		St. Lawrence discharge
South Newfoundland and Iceland cod	Garrod and Colebrook (1978)		
West Greenland cod	Hermann *et al.* (1965)		
North Sea cod	Holden (1970)		
Plaice	Johansen (1927)	Physiological effect of survival, reduction of food supply, Predation	Baltic run-off
Norwegian and Barents Sea cod	Kislyakov (1961)	Larval drift and development time	
Flemish Cap cod	Konstantinov (1978, 1977, 1980, 1981)		
Pacific sardine	Marr (1960)	Physiological effect on maturation, Match/mismatch, Competition with anchovy	Upwelling/ advection
Southern B.C.N.A. cod	Martin and Kohler (1965)	Larval transport	
Downs and Dogger herring	Postuma (1971)	Physiological effect on egg mortality	
North Sea herring	Postuma and Zijlstra (1974)		
Northeast Baltic herring	Rannak (1971)	Physiological effect on mortality	Inflow of North Sea water
Baltic spring herring	Rannak (1973)		Winds
Pacific sardines	Scofe (1958, 1959)		
Yellowtail flounder, Southern New England	Sissenwine (1974)		Overall warming in 40's
Sand eel (*A. marinus*), North Sea	Hart (1974)	Reduction in either food or predation	Atlantic penetration into North Sea
General, off Plymouth	Russell (1973)	Increased survival due to more productive water	Water flow up channel

Table 6.3 Miscellaneous recruitment factors

Species	Reference	Related to	Proposed mechanism	Hypothetical ultimate cause
Plaice (North Sea Kattegat)	Johansen (1927)	Days of ice in Danish waters	Physiological effect of larval survival. Reduction of food. Predation	Freshwater outflow from Baltic
Norwegian and Scottish herring	Beverton and Lee (1965)	Ice cover north of Iceland	Temperature affects duration of development and pelagic phase. Hence affects distance drifted and thereby how close they get to location of polar front	Change in water temperature
Cod (Norwegian)	Sund (1924)	Tree ring width	Heavy spring flood drives larvae out to sea. Hence poor settlement	Snowfall
Atlantic halibut	Sutcliffe (1972 1973)	St. Lawrence discharge		
English Channel herring	Cushing (1961)	PO_4 winter maximum	Affects results from balance of competition with plankton	
Northern anchovy	Lasker (1975, 1981)	Stability of water	Stable water allows local concentrations of food to build up. These enable better feeding for larvae	Storm
Labrador cod	Borovkov (1980)	Index of meridional atmos. circ.	Distance drifted by larvae	
Haddock (Quebec landings)	Sutcliffe (1972)	St. Lawrence run-off		
Mackerel and herring Pacific	Skud (1982)	Temperature and competition	Competition	Temperature change
Sardines Pacific	Skud (1982)	Temperature and salinity and competition	Competition	Upwelling
4WX herring	Sinclair *et al* (1980)	Wind and sea level		Barometric pressure
Skagerrak and Kattegat sprat	Lindquist (1978)	Ratio of temperature and wind force	Fungal infection of eggs	
Georges Bank haddock	Chase (1955)	Temperature and wind strength		

in restricted waters (mackerel). Koslow suggested that the spatial extent of these patterns, which spanned the region from West Greenland to Georges Bank, indicated that large-scale physical forcing, rather than local biological interactions, predominately regulates recruitment to northwest Atlantic fisheries. His results were largely consistent with Templeman's (1972) largely qualitative analysis of recruitment records, which indicated widespread year-class synchrony among Northwest Atlantic gadoid stocks.

In a follow-up study, Koslow *et al* (1987) suggested that the evidence of large-scale, apparently periodic, behaviour in the meteorology and physical and biological oceanography of the Northwest Atlantic pointed to the need for improved understanding of regional climatic processes and their interactions. Detailed field study to determine the actual physical and biological mechanisms underlying apparent statistical relationships was suggested.

Winters and Wheeler (1987) found the recruitment patterns of the seven major spring-spawning herring populations in the Northwest Atlantic to be synchronous and determined largely by annual variations in overwintering temperatures and salinities associated with the Labrador Current.

Leggett and his colleagues have studied recruitment mechanisms in Atlantic capelin. Leggett *et al* (1984) demonstrated the influence of meteorological and hydrographic factors in the regulation of year-class strength in eastern Newfoundland stocks of capelin. They hypothesized that abiotic factors operating at critical periods in larval development may be more important than spawning stock biomass as regulators of year-class strength.

Rothschild (1986) reviewed the extensive literature on recruitment variability and concluded:

> "The specific causes of fluctuations in fish-population abundance are supported by a long list of speculations and a short list of facts. The facts are: (1) the

abundance of individual stocks has fluctuated for centuries; (2) evident human interactions with most marine stocks is relatively recent; and (3) fish stocks have continued to fluctuate in abundance in the presence of increased toxic-chemical loading, eutrophication, habitat modification and fishing."

He advanced a complex unifying model to explain fluctuations in population abundance on a grand scale.

Others take a more pragmatic view of the study of recruitment variability. Leggett (1988) observed:

"I am convinced that there is not one explanation for, or solution to, the recruitment problem. New approaches, and a new willingness to consider alternative hypothesis will therefore be required. There are, undoubtedly, common themes. These provide a framework for a coordinated attack. It is clear, however, that many factors, both biotic and abiotic, operate to regulate the success of a year class. The hierarchy of importance in this framework is likely to vary through time and space, and between species. Identifying the important variables and understanding how they interact in response to key forcing functions is the challenge."

Wooster and Bailey (1989) commented on some impediments to the development of recruitment models. They suggested that a simple deterministic model that accurately predicts recruitment from observed local environmental changes is unlikely. One basic problem,they pointed out, is that variability in the abiotic ocean environment is usually a non-linear response to multiple forcing functions that vary over a wide range of space and time scales. Coupling between abiotic and biotic environments has similar characteristics. These difficulties are compounded by limitations in accuracy of measures of both the relevant environmental variability and the biotic response.

Except for some very simple environmental measures such as sea surface temperature, good environmental indices are difficult to obtain. Also, sampling in space and time is inadequate. Only rarely are time series of reasonable length available. There are difficulties in sampling larvae to determine mortality rates because of the inadequacy of sampling gears (Frank 1988).

The bottom line, as Wooster and Bailey state, is that there is "no simple, unifying hypothesis to explain recruitment variations for all species in all circumstances." Individual populations respond to their local environments in different ways. Wooster and Bailey summarized the current state of the science thus:

> "Decision makers would like firm predictions of year-class strength, but a more realistic goal might be a crude prediction scheme in which, depending on whether environmental conditions had been extreme during the 'critical period' for the stock in question, a credible statement could be made on the probability that its recruitment would be unusually large or small....
>
> "At our present levels of understanding, detailed forecasts of recruitment success from either the level of parent stock biomass or environmental conditions are unlikely. However, generalizations can be tested and rough predictions should be possible on interannual and longer time scales. Perhaps with continued interdisciplinary attention to the recruitment problem, results with greater utility for fishery management will be forthcoming in the next decade."

In a provocative paper entitled "Is Research on Environmental Factors Useful to Fisheries Management?", Walters and Collie (1988) criticized the recent flood of correlative studies purporting to show recruitment rates are related to various environmental factors on the grounds that it is entirely too easy to find spurious correlations. They

pointed out that the acid test of recruitment-environment correlations is the ability to forecast data not available at the time of the original analysis. As an example, Drinkwater and Myers (1987) reanalysed correlations between environmental variables and catches of several Gulf of St. Lawrence and Gulf of Maine fishes. Basically, the correlations reported earlier by Sutcliffe and colleagues broke down with the addition of additional years of data.

In order to understand the interplay between stock size and environment as determinants of productivity, Walters and Collie (1988) recommended "bold and deliberate experiments to establish contrasting stock sizes." They recognized that such experiments would be dangerous for many fisheries situations but argued that there are many cases in which stock-size manipulation experiments could be performed, in conjunction with studies of environmental factors, on species living in spatially discrete subpopulation.

While the approach suggested is intriguing, there are two deficiencies to the line of reasoning advanced by Walters and Collie (1988). First, in the vast majority of fisheries situations fishermen and processors are likely to be unwilling to "experiment" with potential stock collapse. Second, limited experiments in a few specialized fisheries will suffer from the same limitations with respect to extrapolation that Walters and Collie cite as a short coming of "process" studies.

Leggett (1988) argued that prediction of major trends in recruitment could be achievable for most species. He was "less convinced that high resolution prediction of the numbers or biomass of individual year classes recruiting to the fishery will be achieved for more than a handful of species in the foreseeable future."

On balance, I conclude that integrated physical-biological research, combined with in-situ experimental research, while expensive, shows promise of fostering advances

in understanding of recruitment variability. It has to be recognized, however, that there will be no "quick fix" solution to the problem. Progress will require the allocation of substantial funding and harnessing the collaborative efforts of biologists and physical oceanographers on the one hand, and government and university scientists on the other. This is unlikely to provide an improved basis for fisheries management in the short term but could improve the basis for management sometime in the decades to come.

Meanwhile fisheries scientists, managers and the fishing industry will have to learn to live with natural resource variability. The experience of the past several decades suggests that such variability will continue to confound man's attempts to manage the wild fisheries.

3. MANAGING THE COMMON PROPERTY

3.1 The Common Property Problem

Although the world-wide move to 200-mile zones in the 1970s represented the partial enclosure of the global oceans commons by coastal states, within these zones coastal states continued to face the problems arising from the common property nature of marine fish resources.

Gordon (1954) first described clearly the problems arising from the common property nature of the fishery. He compared open access to the fishery to the use of common pasture in the medieval manorial economy and observed:

> "There appears, then, to be some truth in the conservative dictum that everybody's property is nobody's property. Wealth that is free for all is valued by none because he who is foolhardy enough to wait for its proper time of use will only find that it has been taken by another."

Subsequently, the effects of open access to the common property fish resources became known as the Tragedy of the Commons (Hardin, 1968). The fishery, like other natural

resources such as forestry, mining and petroleum, as common property belongs to no one in particular and everyone in general. Unlike other natural resource-based industries, however, few mechanisms have been put in place for participants to enjoy tenure over definable units of the fishery resource base. The common property characteristic of the fishery has been identified as one of the most important factors contributing to overcapacity, inefficiency and instability in the fishing industry (e.g. Kirby, 1982; Pearse, 1982).

Excess fishing capacity is not the result of irrational behaviour on the part of individual fishermen. Because no individual fisherman can control the fishing effort of others, he has a strong incentive to expand his fishing capability to obtain a larger share of the catch or to protect his share from competitors. Although the resulting excess capacity is irrational, it is the result of rational responses of individual fishermen to economic incentives. With open access to a common-property resource, the fishery will attract more labour and capital than necessary to harvest the catch efficiently.

In addition to the perverse effects of competition among fishermen, the common-property nature of the resource leads to similar competition among processing companies for raw material and among provinces for access to raw material to create employment opportunities. Processors are motivated in the same way as fishermen to obtain a larger share of the catch or to protect their share from competitors, leading to increases in capacity and a preoccupation with supply of raw material for processing. Processors compete for fishermen in the same way as fishermen compete for fish. To compound the problem, provincial governments, in order to promote job creation (and attract federal transfer payments), have over the years offered various financial incentives to fishermen

and processors, leading to overcapacity both in the fleet and onshore.

The effects described by Gordon, Hardin and Pearse have been observed in most of the western world's major marine commercial fisheries. Within Canada over the past 25 years a complex web of measures has been developed to deal with the problem of the "race for the fish". These include allocation of access to the resource among user groups, limited entry licensing systems which have been extended to virtually all marine commercial fisheries in Canada, and, in the 1980s, the introduction of individual quotas or enterprise allocations which can be considered as a step toward the evolution of property rights.

3.2 Allocation of Access

Resource allocation is concerned with dividing a limited "pie" among many conflicting interest groups. The size of the pie is rarely large enough to satisfy the needs or the appetites of those seeking shares. The common-property nature of the resource and the lack of intervention at an early stage in the development of a fishery inevitably lead to an overcapacity in the harvesting sector and quite often the processing sector as well. This overcapacity generates enormous conflict as the various interest groups compete for their "fair share" of the resource. To most groups, "fair share" means meeting their needs at the expense of other interest groups. The definition of "fair share" usually depends upon the perspective of the beholder.

Allocation of access to wild fish resources involves the distribution of wealth among various groups involved in the fishery. By its nature, allocation therefore, raises difficult questions of equity. Atlantic Groundfish Fishing Plans, since their inception in 1977, have embodied the principle that "allocation of fishery resources will be on the basis of equity taking into account adjacency to the resource,

the relative dependence of coastal communities and the various fleet sectors upon a given resource, and economic efficiency and fleet mobility." Similar phraseology occurs in the Basic Principles of the Atlantic Salmon Management Plan, the Northern Shrimp Management Plan and others developed in the post-extension era.

Conservation, native food fisheries, adjacency to the resource and community dependence have been stated to be the dominant criteria in resource allocation decisions. Beyond these general considerations, the criteria for allocating access among various groups tend to be blurred. When the pie is shrinking, emphasis is placed on equitable sharing of the burden of conservation. This generally leads to sharing arrangements based upon some interpretation of historic participation, modified to take into account the criteria cited above. When the pie is increasing (e.g. the fierce battles over northern cod allocations in the late 1970s-early 1980s) the allocation battles can be just as heated. Criteria for sharing are formulated through seminars, consultative committees or other fora and then modified over time to take account of changing circumstances.

Most resource allocation decisions appear to be based on subjective interpretation of these criteria rather than analytical frameworks. The pursuit of the most economically efficient resource allocation scenario has not been a prominent feature of decision-making on allocating access. Although in some cases lip service is paid to economic efficiency arguments, for the most part decisions have been weighted by equity considerations. Given the complex nature of fisheries such as these for Atlantic groundfish and Pacific salmon and the role they play in regional economies, this is not surprising.

Healey (1984) explored the use of techniques of decision analysis to provide an analytical model for determining optimum yield. He recognized that, while fisheries managers

tended to shun any appearance of making value judgments, they were making value judgments all the time. He argued that multiattribute utility techniques could be use to bring these values out into the open and assist managers in dealing with the conflicting preferences of the various user groups.

Parsons (In Press) describes the evolution of the regimes governing allocation of access in Canada. Allocation of access is inextricably bound up with concepts of equity and fairness. Hence, allocation decisions will likely continue to be based on subjective value judgments on how the fish "pie" should be shared among the conflicting interest groups. There is merit, however, in pursuing Healey's suggestion of providing the decision makers with practical analytical tools to assist in making these judgments. Attempts to extend this sort of analysis to other species and areas and to real-life application should be encouraged.

The formal allocation-of-access frameworks which have been developed have been superimposed usually on fleet overcapacity situations. Thus, they have not solved the common-property problem. The pie is shared up into discrete segments but then there is competition within each sector for the greatest share of these segments just as there was competition in the open access situation for the greatest share of the global pie. Thus allocation of access among groups by itself does nothing to restrain the tendency to overinvest and build bigger and better boats to catch the fish.

3.3 Limited Entry Licensing

Other approaches have been developed in parallel with allocation of access in an attempt to deal with the negative effects of the common property problem. A great deal has been written during the past 25 years on the problem of limiting fishing effort and the relative advantages and disadvantages of alternative forms of limiting entry to the fishery.

Any control of a fishery that curtails or restricts the addition of fishermen, fishing vessels or equipment constitutes limited entry. Direct limitation of the number of licences to harvest has become the most widely known and widely implemented method of limiting entry into a fishery. Within Canada over the past 25 years limited entry licensing systems have been extended to virtually all marine commercial fisheries. Similarly, limited entry licensing gained acceptance in many countries as the preferred tool for limiting entry (Rettig and Ginter, 1978; Cicin-Sain *et al*, 1978).

A form of limited licensing was introduced in the Atlantic lobster fishery in 1967, but the first comprehensive program to manage a Canadian fishery by means of limited entry licensing was implemented in the British Columbia salmon fishery in 1968. In the decade thereafter, limited entry licensing was gradually introduced throughout Canada's marine commercial fisheries. The number and nature of these initiatives has been so diverse that space precludes a detailed examination here. Parsons (In Press) describes the evolution and impact of this technique in selected fisheries.

3.3.1 Pacific Salmon

The first major experiment with limited entry in Canada was in the B.C. salmon fishery. By the late 1950s increases in fishing capacity threatened the survival of some salmon stocks. In 1958, the federal government commissioned Dr. Sol Sinclair to study the problems of the salmon and halibut fisheries and to develop practices and regulations that would permit economic operations within these two fisheries. His study entitled Licence Limitation-British Columbia: A Method of Economic Fisheries Management (Sinclair, 1960) proposed limited entry licences to be allotted by a competitive auction.

Although fishermen's organizations had pushed the idea of a licence limitation program for a number of years, the Sinclair Report met with a frosty reception from all sectors of the industry. While there seemed to be general agreement on the principle of limited licensing, views diverged as to the form such a system should take and how it might be implemented. During the 1960s some changes were made in the management system which laid the groundwork for limited entry in the future. However, there was no political will to act in the absence of an industry consensus

The political climate changed with the election of a majority government in 1968. The new Minister responsible for Fisheries, Jack Davis, on September 6, 1968, announced a Salmon Licence Control Program to take effect for the 1969 fishing season (DOF, 1968) known as the Davis Plan.

The Plan envisaged four distinct phases:

1. Freezing the fleet at a stable level;
2. Effecting a gradual reduction in fleet size;
3. Improving the standard of vessels participating in the fishery; and
4. Introducing economically optimal gear and area regulations to the fishery.

Minister Davis described the controls as "measures to increase the earning power of British Columbia salmon fishermen and to permit more effective management of the salmon resource by controlling the entry of fishing vessels into the fishery..." (DOF, 1968).

The objectives of the Davis program were as follows:

1. To increase incomes of fishermen to the average regional wage;
2. To reduce the level of overcapacity by reducing the size of the fleet; and
3. To reduce the number of vessels to improve the management of the resource (Newton, 1978).

Details of the Davis Plan and its implementation can be found in Parsons (In Press).

Because it was one of the first comprehensive attempts to apply limited entry licensing for economic purposes, the B.C. salmon limited entry experience has been examined by a number of authors e.g. Fraser (1978, 1979), Newton (1978) and Pearse and Wilen (1979).

Several trends were observed ten years after the program commenced (Fraser, 1978, 1979):

1. The number of fishermen actively employed in the salmon fishery had declined (from about 9,600 in the prelimitation period to about 8,600 in 1979);
2. The number of vessels active in the fishery also declined (from 6,639 in 1967 to 5,028 in 1975);
3. The composition of the fleet changed dramatically, with the decline in fleet size concentrated entirely in the gillnet and troll sectors of the fleet. Hence, it was the smaller rather than the larger vessels that were eliminated;
4. The number of large vessels increased. Non-salmon vessels were converted into salmon vessels or replaced by new salmon seiners. The licences of smaller vessels were consolidated and "pyramided" into larger seine vessels; and
5. There was also a marked increase in the number of combination gear vessels compared with single-gear vessels. As a result, the number of seiners and seine combination vessels increased from 369 in 1969 to 483 in 1975.

The average fishing vessel had become larger and more capital intensive. Average engine horsepower increased by 47 percent for the gillnet fleet, 43 percent for the seine fleet and 36 percent for the troll fleet between 1968 and 1977. Average vessel length increased by 6, 10, and 11 percent, respectively. Average net tonnage increased by 24, 11 and 17

percent, respectively. Thus Fraser concluded that the "average" vessel in the 1979 fleet was "larger, better equipped, and far more mobile than its counterpart in 1968."

Pearse and Wilen (1979) found that the labour engaged in the fishery decreased by about 16 percent between 1968 and 1975 and concluded that the real costs of labour, had, at least, not risen. They also suggested that the program had been partially successful in checking the expansion of capital engaged in the fishery. The capacity of the fleet, which was far in excess of the fishery's needs when the program began, had continued to grow.

MacDonald (1981) reviewed the events in the fishery since the introduction of the Davis Plan and concluded:

> "The licence limitation programme and subsequent replacement restrictions did not tackle the fundamental problem in the fishery; they did not remove the incentive for fishermen to over-invest in harvesting facilities. Instead, they attempted to inhibit a fisherman's ability to over-invest by limiting his capital investment options. The increasing profit potential in the industry in the 1970s resulted in fishermen devising unanticipated methods to circumvent restrictions placed on them...."

Meanwhile, Pearse, in 1981 and 1982, as a result of an industry crisis in the early 1980s, carried out an in-depth examination of the Pacific salmon fishery. In his 1982 report he concluded that:

> "Our catches of salmon and roe-herring could be taken with fleets half their present size and at half the cost now expended in fishing.... The (Davis) plan has clearly failed in its main purpose, which was to control and reduce excessive fishing capacity." (Pearse, 1982)

Pearse proposed that limited-entry licensing systems be replaced by quota licences in "those fisheries where it is feasible to do so." With respect to the Pacific salmon and roe-herring fisheries, Pearse recognized that individual

quotas were not practical. As an alternative, he proposed special measures to improve the limited-entry licensing system and to reduce the fleets.

These included:

1. A fleet-reduction program to reduce the salmon and roe-herring fleets to half their 1982 size over a 10-year period;
2. A policy of allocating the catch among competing sectors of each fleet to ensure that all would share in the benefits of fleet rationalization;
3. Provisions for royalties on landings to capture some of the financial gains from fleet rationalization; and
4. New restrictions on vessel replacement which-coupled with levying royalties and eliminating subsidies-were intended to dampen licensees' incentives to expand their fishing power.

Pearse proposed that all existing ordinary and Indian salmon licences and roe-herring licences be replaced in 1983 by new licences having 10-year terms. These licences were to be allocated through a complex, phased, competitive bidding process. To reduce the fleet during the initial 10-year transition period, Pearse proposed a major voluntary Buy-Back program to be administered by a new Pacific Fisheries Licensing Board.

Pearse's proposals were comprehensive, bold and imaginative. But events during the decade following release of the report have shown that the proposals did not meet two of the three criteria enunciated by Sinclair (1978) as essential to the success of any restricted access program. Sinclair had suggested that any successful program would have to be:

1. Administratively feasible;
2. Politically acceptable; and
3. Publicly defensible.

It is debatable whether Pearse's proposals were administratively feasible. They engendered a storm of public debate over the next five years which made it clear that they were neither politically acceptable nor publicly defensible. His ambitious proposals for restructuring of the Pacific fishery sunk in a tidal wave of opposition and protest from the major interest groups in the fishing industry.

Following extensive consultations with the industry over the next couple of years, Ministers Pierre De Bané and Jack Austin in June 1984 announced a new policy for the Pacific fisheries (DFO, 1984a). The government's proposals involved two steps:

1. Reducing the overcapacity of the fleet and strengthening its financial condition; and
2. The adoption of a "more rational approach to harvesting."

The proposals aimed at reducing the size of the fleet, by as much as 45 percent, through a Buy-Back of at least $100 million, accompanied by a management system "that puts a final end to the 'race to the fish.'" Mr. De Bané announced the government's intention to implement a system of area and gear licensing and individual fishing allocations. The proposals included the creation of a Buy-Back Corporation, with funding by government and financial institutions. Although a total amount of $100 million was mentioned, the details were vague "pending completion of negotiations."

The government tabled in the House of Commons draft legislation to amend the Fisheries Act and to create a new Pacific Fisheries Restructuring Act. On July 9, 1984, the new Prime Minister John Turner dissolved Parliament and called an election. The Liberal Government was defeated and a majority Conservative Government swept to power in the early September election.

The previous government's proposals to restructure the Pacific fisheries were jettisoned. The new Government

launched its own consultations with the industry on how to address the problems of the Pacific fisheries. Consideration was given to implementing a voluntary government-funded Buy-Back Program but such a program never materialized. The concept of individual quotas, which had been opposed by major sectors of the industry, was dropped.

While the B.C. salmon limited entry program, as modified over the years, did not reduce the overcapacity problem in the salmon fisheries or eliminate the incentive to overinvest, it did provide some protection against a surge of new entrants. An internal DFO study of the British Columbia salmon fishery in 1987 indicated that, had the limited entry program not been in effect, the 7,500 licensed vessels could easily have increased to 9,000 or 10,000 during the period of rapid increases in fish prices experienced during the 1980s. (Pacific Region staff, Vancouver, Personal Communication). Instead, the number was reduced to about 4,500 licensed vessels. Despite this curb on expansion, in the late 1980s chronic overcapacity was still regarded as the central economic issue facing Canada's Pacific commercial fisheries.

3.3.2. Atlantic Lobsters

Limited entry was introduced in the Atlantic lobster fishery on an experimental basis in 1967. There has, however, been no systematic attempt to assess the impact of the Atlantic lobster limited entry program.

A Task Force on the lobster fishery was appointed in the spring of 1974, under the chairmanship of Gordon De Wolf. This Task Force concluded that there were many reasons why the lobster fishery probably could not be managed solely on the basis of economic criteria. It recognized that in many areas where there were few alternative occupations a large displacement of fishermen could have serious social consequences and could substantially increase welfare payments (DOE, 1975c).

The Task Force concluded that "the commercial fleet must be reduced by 25 to 50 percent if the fishery is to become economically viable." It also concluded that "the lobster fishery should be reserved for commercial fishermen in regions where such fishing will provide a reasonable standard of living to those engaged in it.... Persons fully employed in other occupations should be eliminated immediately."

The federal government responded quickly to the Task Force Report. On December 30, 1975, Roméo LeBlanc, Minister of State for Fisheries, announced new measures to exclude from the lobster fishery those who earned their living elsewhere to increase returns to 'legitimate' fishermen (DOE, 1975d).

For details of the lobster licensing scheme implemented thereafter, see Parsons (In Press).

Fishermen had suggested a reduction in the number of participants by means of a government-funded voluntary buy-back program. A three-year P.E.I. Lobster Vessel Certificate Program was established in January 1977, jointly sponsored by the federal government and the P.E.I. Department of Fisheries, with funding shared on a 90:10 basis. The objective was to establish "a higher and more stable income for lobster fishermen through a voluntary retirement of vessel certificates." Compensation was determined by multiplying the applicant's average annual documented landings by the average landed value per pound on P.E.I. during the previous year, plus an additional 20 percent to compensate for unrecorded sales. The compensation was to be a minimum of $2,000 but not more than $6,000.

The initial response to the P.E.I. program was considered quite successful. The P.E.I. pilot project had by its midpoint led to the voluntary withdrawal of over 50 percent of its target objective of 400 Category "A" lobster licences.

Spurred by the initial success of the P.E.I. pilot project, on July 29, 1978, Fisheries Minister LeBlanc announced a three-year program "to establish a higher and more

stable income for lobster fishermen in New Brunswick and Nova Scotia" (DOE, 1978b). In total, $5,159,000 was expended to remove 1,569 lobster vessel certificates from the fishery. The majority of those who opted to participate in the program were older fishermen (21 percent over age 64, 36 percent over age 59 and 47 percent over age 54). A DFO evaluation concluded that the program benefited mainly fishermen who wished to retire. Since 63 percent of the prices paid were at the minimum end of the range, it was thought likely that many sellers were inactive licence holders. (DFO, 1983b)

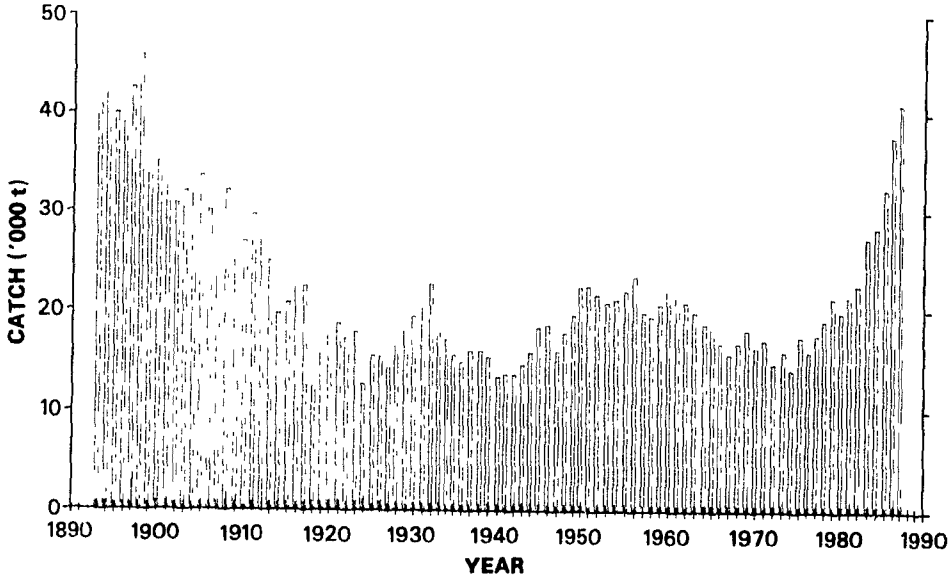
The timing of the program appeared to be opportune in terms of events in the lobster fishery. Catches had declined somewhat just prior to the program and hence fishermen were more inclined to take advantage of the opportunity to get out of the fishery. This was certainly a factor contributing to the significant level of participation in the program.

Subsequently the stocks improved and catches increased during the 1980s (Figure 6-10). The lobster fishery entered a boom period. Licences which had a low value during the poor years became more highly prized. The resurgence in lobster stocks was not a result of any effort reduction resulting from the buy-back program but rather a general Atlantic-wide lobster recruitment pulse (Pringle and Burke, In Press).

The Buy-Back Program removed potential fishing effort from the fishery, about 22 percent of the 1978 total of 6,491 Category "A" lobster licences. With the doubling of lobster catches during the 1980s from 20,000 tons in 1980 to 41,000 tons in the late 1980s, the economic condition of lobster fishermen improved significantly. The benefits of this increased catch were shared among fewer fishermen than would have participated had there not been a Licence Buy-Back Program. From this perspective, I conclude that the Lobster Buy-Back Program had a positive impact on the earnings of fishermen who remained in the lobster fishery.

Fig. 6.10 Trends in Atlantic Lobster landings.

Source: Rivard, D., W. D. McKone and R. W. Elmer, 1988. Resource Prospects for Canada's Atlantic Fisheries, 1989-1993


50
40
30
20
10
0
CATCH ('000 t)
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
YEAR

This conclusion is supported by a 1989 analysis of the Scotia-Fundy lobster fishery (DFO, 1989b). This study revealed that net incomes of the typical lobster vessel (net income to skipper-owners and crew) increased by between 2½ and 7 times from 1978 to 1987.

This study indicated that the impact of limited entry had been dramatic. The number of fishermen would have been much higher without it, costs would have been higher and incomes would have been lower. This supports the general conclusion that limited entry has had a beneficial impact in the Atlantic lobster fishery.

3.3.3. Atlantic Groundfish

In the major Atlantic groundfish fishery, limited entry licensing was not introduced until 1974 and even then not in a comprehensive manner. Different sectors of this fishery were gradually brought under entry restrictions in an incremental fashion until 1980. Prior to 1977, the Atlantic groundfish fishery was only partially carried out in waters under Canadian control. The policy thrust of the 1950s and 1960s had been to develop the groundfish fleet, particularly the offshore trawler fleet, in order to compete with the build-up in the foreign fishery for groundfish off the Canadian coast.

These measures resulted in a marked change in the size and composition of the Canadian fleet. Declining catch rates in the inshore cod fisheries from the late 1950s onward precipitated a significant decline in vessels of less than 10 tons and in total numbers of fishermen. Inshore fishermen left the industry or adapted to larger vessels. The number declined from 49,000 to 39,000 between 1965 and 1973. At the same time, the near-shore, midshore and offshore fleets increased. For example, in the 1964-73 period, vessels in the 35-50 foot length category increased from 1,644 to 2,496; vessels in the 50-75 foot length category increased from 496

to 702; vessels in the 75-100 foot length category increased from 101 in 1964 to 144 in 1970 but declined to 102 by 1974. Vessels greater than 100 feet in length increased from 126 in 1964 to 235 in 1970. There had been a significant increase in capacity in these vessel classes prior to 1964. The number of trawlers greater than 100 feet in length increased from 26 in 1947 to 156 in 1965.

The overall number of vessels declined slightly during the 1970-74 period with most of the decline occurring in the small boats category. The number of vessels greater than 75 feet in length also declined during this period as a result of the decline in the Atlantic herring fishery.

Between 1974 and 1979 the number of vessels increased again to the 1964-65 level. The increase was due to the growth in the numbers of nearshore and middle-distance vessels-vessels between 35 and 100 feet in length. The major change occurred between 1976 and 1979; in 1976 there were 3,304 such vessels but by 1979 the number had increased to 5,872 vessels.

The increase in the number of vessels between 35 and 100 feet in length was fuelled by high expectations of potential benefits from the 200-mile limit. The expansion was encouraged by the provision of vessel construction subsidies by both provincial and federal governments. In many instances, fishermen replaced existing vessels with larger, more productive and expensive vessels in the expectation that resource availability would increase significantly. While replacement rules at that time placed some constraint upon the size of vessels in terms of increase in overall length, they did not exclude major increases in vessel tonnage and horsepower.

Limited entry licensing for groundfish was introduced piecemeal during the 1970s. Prior to 1973 offshore trawlers, draggers and Danish seiners were required to obtain fishing licences. However, there was no restriction on entry into

these fisheries. By 1973 resource managers were becoming increasingly concerned about the rapid expansion in the number and catching capacity of the Atlantic fleet. While there appeared to be prospects for an expanded Canadian share of the North Atlantic catch in the future, a serious short-term imbalance between catching capacity and available resources appeared imminent.

On November 14, 1973, Environment Minister Jack Davis announced what was termed "a new fishing fleet development policy for Canada's Atlantic Coast." The stated aim of the policy was "to match fleet size to fish stocks by instituting a more selective subsidy program for vessel construction and by establishing a new licence control program" (DOE, 1973).

Subsequently, the number of offshore trawlers was frozen and entry into the offshore fishery restricted. Licences were introduced for fixed gear (gillnets, longlines, etc.) fisheries in the Maritime Provinces in 1974 but entry controls were not rigorously applied. Over the next seven years, similar measures were adopted for the other groundfish fleet components as follows:

1. June, 1976-Licences for otter trawling by vessels under 65 feet were limited;
2. November, 1978-A moratorium was placed on entry to groundfish fishing by vessels under 65 feet in all of Subarea 4 and Division 3P (the east and north coasts of Newfoundland and Labrador were not included because of the anticipated growth in the northern cod stock);
3. June, 1979-The moratorium was relaxed to allow entry by vessels using baited gear only and to remove restrictions on personal commercial fishing licences on inshore vessel registrations for residents of Labrador;

4. March, 1980-A complete freeze was placed on entry of inshore groundfish vessels anywhere on the Atlantic coast;
5. May, 1980-A limit was placed on the issuing of otter trawl licences to vessels under 65 feet in eastern and northeast Newfoundland and Labrador (Divisions 2J-3KL); and
6. June, 1980-A complete freeze was placed on the issuance of personal commercial fishing licences.

The 1980 measures were taken to arrest the tremendous influx of additional persons and vessels to segments of the inshore fisheries where entry was not limited. The lack of entry restrictions for this sector of the groundfish fishery had allowed a significant growth in the number of vessels less than 65 feet in length. This contrasted sharply with the offshore sector where replacements were controlled following 1973 and there was no significant growth in harvesting capacity, apart from technological improvements.

As of 1973-74 no additional unrestricted groundfish trawling licences for vessels over 65 feet were made available. Only licences issued at that point were valid. Active vessels could be replaced but each replacement required Ministerial approval. Large otter trawl vessels could be replaced on a one-for-one basis with the new vessel not exceeding 125 percent of the length of the replaced vessel. A single vessel could also replace two or more vessels provided the length of the single vessel did not exceed 80 percent of the combined length of the replaced vessels. These replacement guidelines were intended to control the addition of fishing capacity and to limit excess capital investment. Effectively, the harvesting capacity of the offshore fleet was constrained to the level existing in 1974 since very few replacements occurred. For example, between 1973 and 1980 only 14 unrestricted otter trawl vessels over 100 feet were acquired. All replaced existing vessels one-for-one.

Because entry restrictions for groundfish vessels less than 100 feet were introduced later than for the offshore fleet, the number of vessels in this size category increased significantly as did vessel capacity. In July, 1976, the following vessel replacement rules were adopted for vessels less than 65 feet:

1. Vessels 45 feet and less in length-open access to all gear types;
2. Vessels between 45 feet and 65 feet were placed under limited entry, with licences issued only to a vessel which had been licensed in the previous two calendar years (1974 and 1975); and
3. A replacement vessel in the 45-65 foot class could not exceed 125 percent of the length of the vessel being replaced up to a maximum of 64 feet 11 inches.

The Ministerial freeze on the issuance of licences originally introduced on August 13, 1973 and extended twice subsequently allowed authorization of new licences only for vessels less than 45 feet (and for longlining). (Originally, the freeze included vessels of all sizes but was relaxed, following representations, to exempt vessels less than 45 feet). In Newfoundland the freeze on new otter trawl licences remained in place for vessels of all sizes because Newfoundland did not have a traditional small vessel (<45 feet) dragger fleet.

The July 1976 policy led, over time, to a large overcapacity problem as a result of the development of a new fleet of super 45-foot and 65-foot vessels in the Maritimes, particularly in southwest Nova Scotia.

In November, 1978, a six-month freeze on new entrants into the inshore groundfish fishery was announced (DOE, 1978c). This became known in bureaucratic circles as the "warm freeze", because senior Maritime Region officials interpreted this as a freeze on only otter trawlers over 45

feet. As a result, several hundred new otter trawl licences were issued in 1979 to individuals who already had at least one other fishing licence. This led to a substantial expansion of the small dragger fleet. This, combined with existing replacement rules for vessels less than 65 feet in length, was a recipe for disaster. The enormous overcapacity problem in the southwest Nova Scotia small vessel fleet of the late 1980s can be traced in large part to those policies and the manner in which they were implemented.

Apart from the question of fleet capacity, by 1978 it was apparent that there were a number of problems with the implementation and application of Atlantic licensing policy, with approaches varying greatly among Regions and among various fisheries. Because of its piecemeal development, the system was administratively cumbersome and frequently misunderstood by the public and fishermen. There was little opportunity for public input into the licensing decision-making process.

Because of these problems, a special study was commissioned in 1978 by Fisheries Minister Roméo LeBlanc. The study, headed by former federal Fisheries executive Cliff Levelton, placed particular emphasis on the groundfish fishery, harvesting capacity, the problems of controlling entry in the fisheries and the future structure and ownership of the fishing fleet. Extensive consultations were undertaken with fishermen, processors and provincial government representatives over a period of several months.

The Levelton Report, entitled Toward an Atlantic Coast Commercial Fisheries Licensing System, released in June 1979, described the existing Atlantic licensing system as "complicated and confusing and not easily understood by those in the fishing industry or even by those administering the system." (Levelton, 1979).

The Report reiterated the advantages of limited entry and recommended that limitation of entry be maintained in those

Atlantic coast fisheries where it was already in place and that expansion in those fisheries take place only as the overall situation permitted. It also made a number of specific recommendations for changes to the existing licensing system.

The Levelton Report took a middle-of-the-road approach on most licensing issues. Most of the recommendations with respect to the licensing system were accepted and implemented by DFO. By 1982 all Atlantic fisheries were placed under limited entry. A fisherman licence categorization system was introduced in 1981 and local licensing committees established to provide a forum for consultation on licensing policies.

Some steps were taken in 1980 to address the problem of overcapacity in the inshore-nearshore fleet sector by cancelling inactive licences for otter trawlers less than 65 feet in length. As a result of the "warm freeze" the number of otter trawler licences for vessels less than 45 feet in length had more than doubled in the Maritimes from 733 in 1977 to 1,939 in 1979. Faced with this situation, DFO decided to permit the reissuance of 1979 licences only on the basis of proven landings in 1979 or evidence of purchase of the appropriate gear for otter trawling. Of these inactive licences 814 were cancelled by the end of 1980 (Pierre Comeau, DFO, Ottawa, Personal Communication). This action helped prevent an already serious overcapacity problem from becoming even worse.

In recognition of the growing overcapacity in the small vessel fleet, a revised groundfish vessel replacement policy was announced on June 16, 1981 (DFO, 1981a). This policy restricted the replacement of all vessels greater than 35 feet in length to a foot-for-foot, hold-for-hold basis. Following consultations with industry, this replacement policy was modified in August, 1981, such that vessels between 35 feet and 64 feet 11 inches could be replaced within five-foot intervals: i.e. 35'-39'11", 40'-44'11", 45'-49'11", up to 60'-

64'11". This created barriers at five-foot intervals which could not be exceeded by replacement vessels. It was estimated that, over time, this could result in an increase in fleet capacity of between 8 and 14 percent.

Vessels between 65 feet and 100 feet in length could be replaced only on a foot-for-foot basis with a 5 percent tolerance factor. The hold capacity of any replacement vessel 35 feet and over could not exceed that of the vessel it was replacing by more than 10 percent. For vessels less than 35 feet in length, replacements could not exceed 34 feet 11 inches.

A 1987 DFO analysis indicated vessel length overall had been the most dominant restriction (DFO, 1987c). This study indicated that the 1981 groundfish vessel replacement guidelines had permitted a "modest" increase in the size and capacity of fishing vessels within the designated 5-foot intervals and the 10 percent carrying capacity restrictions. The guidelines had also permitted increases in effective capacity as a result of technological change or improvements in vessel or gear design.

It appears that the growth in overcapacity in some segments of the inshore/nearshore fleet, particularly in southwest Nova Scotia, was the result of action taken too late combined with administrative blunders which subverted the intent of the policy (e.g. the so-called "warm freeze" in the Maritimes). The replacement rules introduced in 1981 appear to have put a "cap", with a certain margin of slippage, on the growth of the fleet. But, as in many other limited entry fisheries worldwide, it was a case of closing the barn door after the horse had escaped.

The effects of the overcapacity problem in southwest Nova Scotia became apparent by the mid-1980s. Quotas were caught early and fisheries closed down resulting in pressure on the federal government to increase TACs and to reallocate fish from the offshore to the inshore fleet. This resulted in a

number of temporary quota transfers in 1985, 1986 and 1987, culminating in a permanent transfer of 12,000 tons of groundfish from the offshore to the inshore under the 1989 Groundfish Management Plan. The 1987 Groundfish Plan proposed a whole array of measures to slow down the fishery, improve quality and increase returns to the industry. These measures included seasonal quotas and trip limits to help slow down the fishery and measures to enhance quality, like bleeding and gutting at sea. Because of the overcapacity problem on the Scotian Shelf Minister Siddon declared a moratorium for 1987 on the issuance of inactive groundfish licences as well as a one-year freeze on the combining of these licenses (DFO, 1986d).

In July, 1989, Minister Siddon established a Task Force on the Scotia-Fundy Groundfish Fishery, headed by Jean Haché, Director General, Scotia-Fundy Region of DFO. This was prompted by the closure of most of the groundfish fishery to the inshore mobile gear (dragger) fleet, resulting in plant closures, layoffs and general hardships. The Task Force in its December 1989 Report (DFO, 1989c) confirmed the conclusion of previous studies that the excessive catching capacity of the inshore fleet, particularly the mobile gear sector, was the major underlying problem.

The Task Force identified two major trends-declining stocks and increasing fishing capacity. It concluded that harvesting capacity and the accompanying overinvestment must be reduced as quickly as possible. To accomplish this, the Task Force recommended that fishermen in the highly capitalized, high capacity mobile gear fleet (approximately 400 licence holders) be provided with sufficient flexibility to choose a fleet management system acceptable to themselves and to DFO. These choices would include a strictly enforced group quota, individual quotas, or individual transferable quotas. The group could also collectively opt for some type of self-funded licence retirement scheme. In announcing the

1990 Groundfish Plan, Minister Siddon indicated that boat quotas would be introduced for the mobile gear sector in southwest Nova Scotia to deal with the overcapacity problem.

In January, 1989, Fisheries Minister Siddon had issued a new policy document entitled Commercial Fisheries Licensing Policy for Eastern Canada (DFO, 1989d). This document consolidated all federal licensing policies for the commercial fisheries in Atlantic Canada.

The definition of a licence differed significantly from the transferable licence approaches proposed by the Economic Council of Canada, the Pearse Commission and the Task Force on Atlantic Fisheries. Section 4(2) of the Policy defined a "fishing licence" as:

> "An instrument by which the Minister of Fisheries and Oceans, pursuant to his authority under the Fisheries Act, grants permission to a person (an individual or a company) to harvest a certain species of fish, subject to the conditions attached to the licence. This is in no sense a permanent permission; what the licensee essentially acquires is a limited fishing privilege rather than any kind of absolute or permanent 'right'.
>
> "A fishing licence grants private access to, and use of a common property resource-such a resource cannot be alienated to 'private ownership' (private property) without extinguishing its 'common property' nature."

By so defining a fishing licence, the government sent a clear message that it was rejecting the views of various experts who had advised over the previous decade that the resource should be privatized in one form or another.

One of the most significant changes involved the replacement rules for vessels between 35 and 65 feet in length. Replacement rules based on vessel length and hold capacity were changed to an overall measure of vessel capacity, a cubic number derived from length, width and depth. This new approach, a result of extensive technical work and

parallel initiatives on vessel replacement rules in other countries, was intended to provide fishermen with more flexibility in choosing a replacement vessel while also providing the government with a more effective mechanism to control fleet capacity.

3.3.4. Limited Entry Licensing - General

Following the introduction of limited entry licensing to the Atlantic lobster fishery in 1967 and the B.C. salmon fishery in 1968, virtually all commercial marine fisheries in Canada were placed under limited entry licensing by the late 1970s. Experience suggests that the use of limited entry licensing to curb overcapacity and the tendency to overinvest has met with a mixture of success and failure.

Based on analyses of the B.C. salmon licensing program, many have criticized the utility of limited entry licensing as a means of curbing overcapacity and overcapitalization. The experience in the inshore-nearshore groundfish fishery on the Atlantic coast, particularly the southwest Nova Scotia overcapacity problem, lends some support to that view.

On the other hand, the experience in the Atlantic lobster fishery has been more positive. In this fishery, limited entry licensing clearly had a beneficial impact in terms of constraining additional entry under circumstances of a resource resurgence. Limited entry licensing and vessel replacement guidelines also constrained the growth of capacity in the offshore groundfish fleet on the Atlantic coast from the mid-1970s onward. As the resource recovered following extension of jurisdiction, limited entry licensing combined with a conservative Total Allowable Catch regime generally resulted in significantly improved catch rates and reduced costs of fishing. Until the downturn in the resource at the end of the 1980s, there was little evidence of excess harvesting capacity in the offshore groundfish fishery.

Limited entry licensing has been introduced in most fisheries only after harvesting capacity has already become excessive. There are other instances within Canada, for example, the Atlantic Northern Shrimp fishery, where limited entry licensing was imposed in a developing fishery. This experience suggests that limited entry licensing applied at an appropriate juncture in the development of a fishery, with tight controls on vessel replacement, can generate positive benefits.

Many of the perceived shortcomings of limited entry licensing occur because limited entry is usually introduced late in the game, after the problems of overcapacity and overcapitalization have become perhaps uncontainable or insoluble. Furthermore, as demonstrated by the manner in which limited entry was introduced in the Atlantic inshore groundfish fishery, restrictive action is often not taken sufficiently early in the process. Ad hoc implementation over time contributes to the growth of overcapacity because of the incentive to beat the controls before they become tougher.

Even though limited entry licensing has had beneficial effects in some fisheries in constraining capacity growth and in some cases preventing overcapacity, in many fisheries there was substantial overcapacity in existence when limited entry licensing was introduced. One of the fundamental challenges is what to do in such overcapacity situations. Limited licence buy-back schemes have been tried in certain fisheries, e.g. B.C. salmon, Atlantic lobster, Atlantic salmon, with varying degrees of success. The B.C. Program was too short in duration to reduce fishing effort significantly. The Atlantic Lobster Buy-back Program had a positive impact. An Atlantic Salmon Licence buy-back program in 1984, 1985 and 1986 was also successful in reducing the number of active participants in the Atlantic salmon fishery in a situation of resource crisis.

Despite its shortcomings, limited entry licensing has proven to be a useful tool in the management of Canadian fisheries. The very high price that limited entry licences now bring to those leaving the fishery is strong evidence that limited entry licensing has improved fishermen's incomes.

A major challenge lies in reducing fishing capacity in fisheries where significant overcapacity exists. Apart from buy-back programs, output controls in the form of quasi-property rights (individual catch quotas) have often been suggested as more effective rationalization schemes.

3.4. Individual Quotas

The various forms of input controls (e.g. limited entry licensing, vessel replacement rules) all attempted to deal with the effects of the common property problem rather than the cause. The idea of output controls in the form of individual quotas was first raised seriously in the 1970s in a paper by Christy (1973). He suggested fisherman quotas. Christy saw his proposal for fisherman quotas as a logical extension of the national quotas approach in the international fishery. He suggested that the greatest advantage of a system of fisherman quotas would lie in its flexibility and the freedom it would give to fishermen "to innovate as they wish and avoid the onerous and cumbersome constraints of detailed regulations on size of vessel and kind of gear."

During the period from 1979 to 1982, a number of economists seized on individual quotas, quasi-property rights, or quantitative (stinted) rights as the method to achieve economic rationalization of fisheries. Scott (1979) and Moloney and Pearse (1979) became strong advocates of some form of quantitative or stinted rights as the ideal instrument for regulating commercial fisheries. By 1981 the federal government had initiated discussions with operators in the Canadian Atlantic offshore groundfish industry and a large scale experiment with enterprise allocations (company quotas)

was introduced in that fishery for 1982. Following industry upheaval and the restructuring of the offshore groundfish fishery in 1983, a formal system of enterprise allocations was adopted as a 5-year experiment in this fishery, effective from 1984 to 1988 (Parsons, 1983). This was subsequently adopted as an ongoing management method for this fishery.

Meanwhile, Scott and Neher (1981) had made an impassioned plea for the widespread adoption of a system of individual and exclusive rights of access. They envisaged marketable divisible quotas specific with respect to species, time, location and gear. Their plea was followed by Pearse's (1982) proposal for a system of 10-year quota licences and an auction system for the Pacific fisheries. The Task Force on Atlantic Fisheries (Kirby, 1982) also recommended a system of quasi-property rights for the Atlantic fisheries, in the form of individual licences specifying either a limitation on the catch or on the catching capacity of the fisherman's vessel and gear. These quota licences would also be divisible and transferable, i.e. marketable.

Various terminologies have been employed to describe variants of this approach, e.g. quota licences, enterprise allocations, and individual transferable quotas (ITQs). Here "individual quotas" will be used as the generic term for this approach. By 1983 fisheries economists had embraced the individual quota approach as the means to eliminate the perverse effects of open access fisheries. Governments, both in Canada and elsewhere, were experimenting with the approach in selected fisheries, albeit cautiously with respect to the suggested provisions for the sale and trading of quotas.

The rationale for an individual quota system is that it would eliminate the incentive to overinvest and end the competitive "race for the fish". Under an individual quota system, the available catch (e.g. Total Allowable Catch for a particular stock) is divided among individual fishermen, fishing units or fishing enterprises in advance of the fishing

season. Each individual, unit or enterprise is assigned a fixed share of the TAC, either as a specific quantity or as a percentage of the TAC either for one year or for a longer period. Percentage shares of the TAC in a given season translate into specific quantities once the TAC for that season is determined.

A system of individual vessel quotas had already been introduced in the Bay of Fundy purse seine herring fishery commencing in 1976. A modified system was adopted in 1983 for a ten-year period, with many of the features of a quasi-property rights quota system.

During the 1980s the concept of individual quotas as a management tool for Canada's fisheries was widely debated and tested in several major fisheries on the Atlantic coast and, to a lesser extent, on the Pacific coast. A number of additional experiments were launched at the beginning of the 1990s. Experimentation is still underway but there is sufficient experience and information available on which to base some tentative conclusions. Details on the nature and results of these experiments with individual quotas can be found in Parsons (In Press).

The successful application of enterprise allocations in the Atlantic offshore groundfish fishery indicates that a system of individual quotas can have considerable positive impacts. Chief among these has been the damping of the incentive to "race for the fish" in order to maximize an enterprise's share of the total allowable catch. Experience in several fisheries has confirmed that individual quotas provide flexibility as to when, how and if an enterprise will harvest its allocation during a given year. Both the Atlantic offshore groundfish fishery and, to a lesser extent, the Bay of Fundy herring fishery have provided some evidence that individual quotas foster fleet rationalization, although not to the extent anticipated. Another major benefit has been the

transformation from a volume-driven to a market-oriented fishery.

However, there are some disadvantages to individual quotas. Chief among these are the problems of high-grading (through discarding at sea), misreporting and underreporting of catches and the consequent difficulty of ensuring compliance with individual quota management regimes (Parsons, In Press). Massive underreporting in the Bay of Fundy herring fishery, the discarding early in the Atlantic offshore groundfish EA experiment, widespread underreporting in the western Newfoundland small otter trawler fishery and underreporting in the British Columbia abalone fishery, all attest that this problem is far greater in scope than originally envisaged (Parsons, In Press). Virtually all of the early proponents of individual quotas, with the exception of Stokes (1979), downplayed the potential impact of this problem on the effectiveness of an individual quota system. The Canadian experience suggests that mechanisms to ensure compliance must be built into the design of Individual Quota systems, if they are to have any hope of success. Now that the magnitude of this problem has been recognized, managers are taking steps to try to minimize the incentive to cheat. These include the placement of observers on offshore groundfish trawlers, the designation of ports of landing and industry-funded port inspectors in the recently-introduced individual vessel quota systems in British Columbia, and the introduction of a complex system of designated landing points, observers, plant audits and penalties in the recently-introduced small trawler experiments in the Gulf of St. Lawrence and southwest Nova Scotia.

There has been a belated recognition that this problem is serious enough to wreck any attempts to rationalize fisheries through the use of individual quotas. There is still, however, insufficient recognition that the incentive to misreport or underreport in an individual quota system is

possibly as large and as problematic for successful fisheries management as the incentive to maximize one's individual share of the total catch in an open access or limited entry fishery. Because of this incentive to cheat, individual quota management schemes are inappropriate for situations where landings occur at a large number of geographically dispersed ports. This means, for example, that individual quota systems would be ineffective for the small-boat (vessels less than 35 feet) fisheries on the Atlantic coast where you have thousands of vessels landing at numerous, scattered, and, in many cases, relatively isolated landing points.

In order for there to be any prospect for successful implementation of an individual quota system, fishermen must be willing participants in the design of such a scheme. This is vividly demonstrated by the Atlantic offshore groundfish trawler experiment where the offshore companies collaborated with government officials in designing the original system and subsequent modifications to it. The success of this effort over the past decade has resulted in large measure from ongoing dialogue among the companies, the provinces and federal government officials. The design and evolution of the enterprise allocations system for this fishery has been a cooperative endeavour, which culminated in its adoption on a permanent basis in 1989. Similarly, it was possible to introduce enterprise allocations in the otter trawl fishery in western Newfoundland because fishermen recognized the need for change and participated on an ongoing basis in the design and modification of the EA system. This was also true of the initial experience in the Bay of Fundy purse seine fishery and the subsequent modifications in 1983. Most recently, it has been possible to break the logjam on the Pacific coast and introduce a trial enterprise allocation system in several fisheries (e.g. geoduck, sablefish and halibut) because the participants themselves requested that such systems be put in place.

The success of some of the Atlantic trials of EA systems has been fostered by willingness of government to take a "go-slow", cautious approach, learning from initial experience and modifying schemes as they evolve, i.e. adaptive management. Another facet of this has been the recognition that one theoretical scheme cannot be force-fitted to all fisheries and circumstances. Instead, on the Atlantic coast, government has manifested a willingness to design EA systems to meet the needs and circumstances of particular fisheries. A major shortcoming of Peter Pearse's proposals for the Pacific fisheries was that he attempted to design an ideal, uniform scheme for most fisheries, which incorporated a major feature - 10-year licences open to competitive bidding - which was unacceptable to the participants in those fisheries. The Task Force on Atlantic Fisheries advocated the general principle of a move to quota licences but left the details to be worked out by government officials in close cooperation with the industry. This difference largely explains why we had numerous trials of individual quota systems in various Atlantic fisheries during the 1980s and early 1990s. On the Pacific coast, on the other hand, real experimentation with individual quotas did not take place until the 1989-1991 period.

There is one essential difference between most of the individual quota systems which are being tried or in place and the model advocated in the early 1980s by Scott and Neher (1981), Pearse (1982) and Kirby (1982). These three major reports all advocated transferable, divisible and marketable quota licences. With a few exceptions, the individual quota systems adopted for Canada's marine fisheries over the past decade have not incorporated provisions for transferability and marketability. A major exception was the modified plan adopted in 1983 for the Bay of Fundy purse seine fishery. In the Bay of Fundy example, constraints were placed on how much of the Total Allowable Catch could be held by one licensee (4

percent) and transferability was restricted within certain categories of vessels. More recently limited transferability has been adopted in the otter trawl fishery less than 65 feet in the Gulf of St. Lawrence.

Thus permanent transfers are allowed in only two of the ten fisheries under individual-quota regimes on the Atlantic coast. Within-season transfers are permitted in the others to provide some short-term operating flexibility. There are rules concerning how much quota can be transferred and to whom. These are aimed at preventing concentration of quota, increased vertical integration between processing and harvesting operations, speculation in quotas by non-participants in the fishery and entry of operators whose enterprises are not majority-owned by Canadians. On the Pacific coast, the recent geoduck (1989) and sablefish (1991) programs allow for limited transferability of vessel quotas.

In general, governments have been reluctant to allow the permanent selling or trading of individual quotas. The policy document describing the original 5-year experiment (1984-88) for the offshore groundfish fishery (Parsons, 1983) envisaged that permanent sales and trades would be permitted either during or following the five-year trial. It later became evident that provincial governments on the Atlantic were opposed to such sales or trades. At a December 1988 meeting of the Atlantic Council of Fisheries Ministers the federal and provincial governments agreed that permanent transferability or marketability of enterprise allocations would not be permitted. This seems to apply to most of the other enterprise allocation trials underway in the Atlantic fisheries. Frequently, transferability is resisted by fishermen who fear the concentration of the privilege to fish in the hands of companies and large scale operators. The result is that individual quotas in Canada's marine fisheries represent constrained harvesting rights rather than quasi-property rights. Minister Siddon described the offshore

groundfish EAs as "a harvesting privilege for a specified share of the resource subject to scientific advice and Ministerial decision." Although a DFO Working Group in 1990 recommended that the concept of transferability should be established during the development of all Individual Quotas regimes (Paul Sutherland, DFO, Winnipeg, Personal Communication), progress towards free transferability and marketability is likely to be slow.

Individual quota systems are clearly not suitable for all fisheries. Since stability is one of the major benefits offered by individual quotas, it follows that individual quotas are inappropriate for species/stocks/fisheries where the available catch fluctuates widely from year to year because of fluctuations in resource abundance or availability. This means that individual quotas are not an appropriate management tool for fixed gear fisheries such as the inshore cod trap fishery in Newfoundland which is subject to substantial year-to-year variation in resource availability. Similarly, individual quotas are probably inappropriate in the case of the Pacific salmon fishery where there are widespread year-to-year fluctuations in abundance and availability of the resource to particular types of gear and at different points along the complex migration routes of the five Pacific salmon species.

Based on the Canadian experience over the past decade, it seems clear that individual quotas are an effective management tool for the management of some, but not all, fisheries. Some of the envisaged benefits, particularly the reduction of the incentive to maximize the individual share of the catch, are achievable without free transferability or marketability of individual quotas. The reduction of gluts, the landing of better quality fish, the reorientation from a volume-driven to a market-focused fishery are all tangible benefits of the individual quota approach as it has been applied in a number of Canadian fisheries.

As with limited entry licensing, one of the chief constraints on individual quotas is the difficulty of introducing them in a fishery where there is already grossly excessive capacity. One of the reasons why it was possible to introduce them relatively smoothly in the Atlantic offshore groundfish fishery was that the mismatch between harvesting capacity and available offshore quota was relatively modest. In the Bay of Fundy purse seine fishery, on the other hand, the considerable overcapacity in the harvesting sector led to major problems of quota busting and data fouling.

On balance, individual quotas offer considerable promise to improve the effectiveness of management of Canada's marine fisheries. They will work well in some fisheries, e.g. offshore groundfish, but they will probably be less effective in others, e.g. small otter trawler fleet. There are some fisheries for which they are clearly unsuitable, e.g. residual catch fisheries such as Pacific salmon, flash fisheries such as Pacific roe herring and Atlantic roe capelin, and the fisheries conducted by thousands of individual fishermen at hundreds of geographically dispersed ports such as the Atlantic small-boat fixed-gear inshore cod fisheries. The trials currently underway in the Gulf of St. Lawrence and in southwest Nova Scotia with small otter trawlers less than 65 feet in length will provide a better assessment of their applicability in fisheries where the number of participants and landing points fall somewhere between these two extremes.

Individual quota systems have to be carefully tailored to the different characteristics of particular fisheries. In situations where there is significant noncompliance with individual quotas, the individual quota approach is worthless. The challenge is to apply individual quotas in appropriate fisheries and with appropriately designed compliance mechanisms, an essential feature of which is the voluntary acceptance by fishermen of the benefits of individual quotas as a management tool for their fishery. Under such

circumstances, individual quotas constitute a useful addition to the array of fisheries management tools which have been traditionally employed to manage fisheries. Individual quotas are not, however, a panacea for the myriad of problems arising from the common property nature of fish resources.

4. INTERNATIONAL FISHERIES PROBLEMS POST-EXTENSION

4.1. The Straddling Stocks and Overfishing Beyond 200-Miles

Although the bulk of the marine fish resources off Canada's coasts fell within Canada's 200-mile fisheries zone, seven stocks on the Grand Bank straddled the 200-mile limit and could be fished by foreign fleets outside 200 miles. Another three stocks on Flemish Cap lay entirely beyond 200 miles.

These represented 10 of the 56 groundfish pelagics and squid stocks under quota management off the Canadian Atlantic coast (CAFSAC, 1986). In terms of the overall Canadian Atlantic fishery, their importance was significantly less than appeared from just the number of stocks. Excluding squid, a variable resource fished only occasionally outside 200 miles, in 1978 Canada's catch from the remaining nine stocks was 78,962 tons, representing nine percent of the total Canadian Atlantic catch of groundfish and pelagic species (ICNAF, 1985).

Nonetheless, Canada felt overfishing of these stocks could pose a significant problem unless adequate mechanisms were in place to ensure that management of those stocks was consistent with measures taken by the coastal state. It therefore moved quickly to secure agreement on a new multilateral forum for the management of stocks beyond 200-miles off its Atlantic coast.

Canada convened a Preparatory Conference in Ottawa, in March 1977, which considered a convention drafted by Canada. This draft envisaged an organization with management powers in the area beyond 200 miles and a scientific consultative role

for the convention area as a whole, including the 200-mile zone of coastal states. A second Preparatory Meeting was held in June 1977 to further discuss the Canadian draft.

Canada's major objective in these negotiations was to secure recognition of its special interest in the area outside but immediately adjacent to the Canadian 200-mile zone on the Atlantic coast. Canada sought to embody in the new convention provisions that conservation regulations for the Grand Banks and Flemish Cap stocks would have to be consistent with Canadian regulations within 200 miles, and that Canada as the coastal state would be entitled to preferential shares of the TACs for these stocks. At the Preparatory meetings few countries expressed support for this position.

In several bilateral agreements signed post-extension (in 1977 and early 1978) with Bulgaria, Cuba, the GDR and Romania, Canada was able to incorporate recognition of "the special interest of Canada, including the needs of Canadian coastal communities" in the resources beyond and immediately adjacent to the Canadian 200-mile zone.

Compromise on a new multilateral convention was achieved in October 1977 when Canada agreed to the phrase: "The Commission shall seek to ensure consistency" between its conservation measures for straddling stocks and those taken by the adjacent coastal state. Further compromise occurred at a Group of Experts meeting in May 1978 on the wording presently found in Article XI.4 of the NAFO Convention: "Commission members shall give special consideration" to the adjacent coastal state.

NAFO held its first substantive meeting in 1979, in conjunction with the last meeting of ICNAF. The new organization consisted of three bodies: a General Council, a Scientific Council and a Fisheries Commission. The General Council is an administrative body. The Scientific Council provides a forum for consultation and cooperation with respect to "the study, appraisal and exchange of scientific

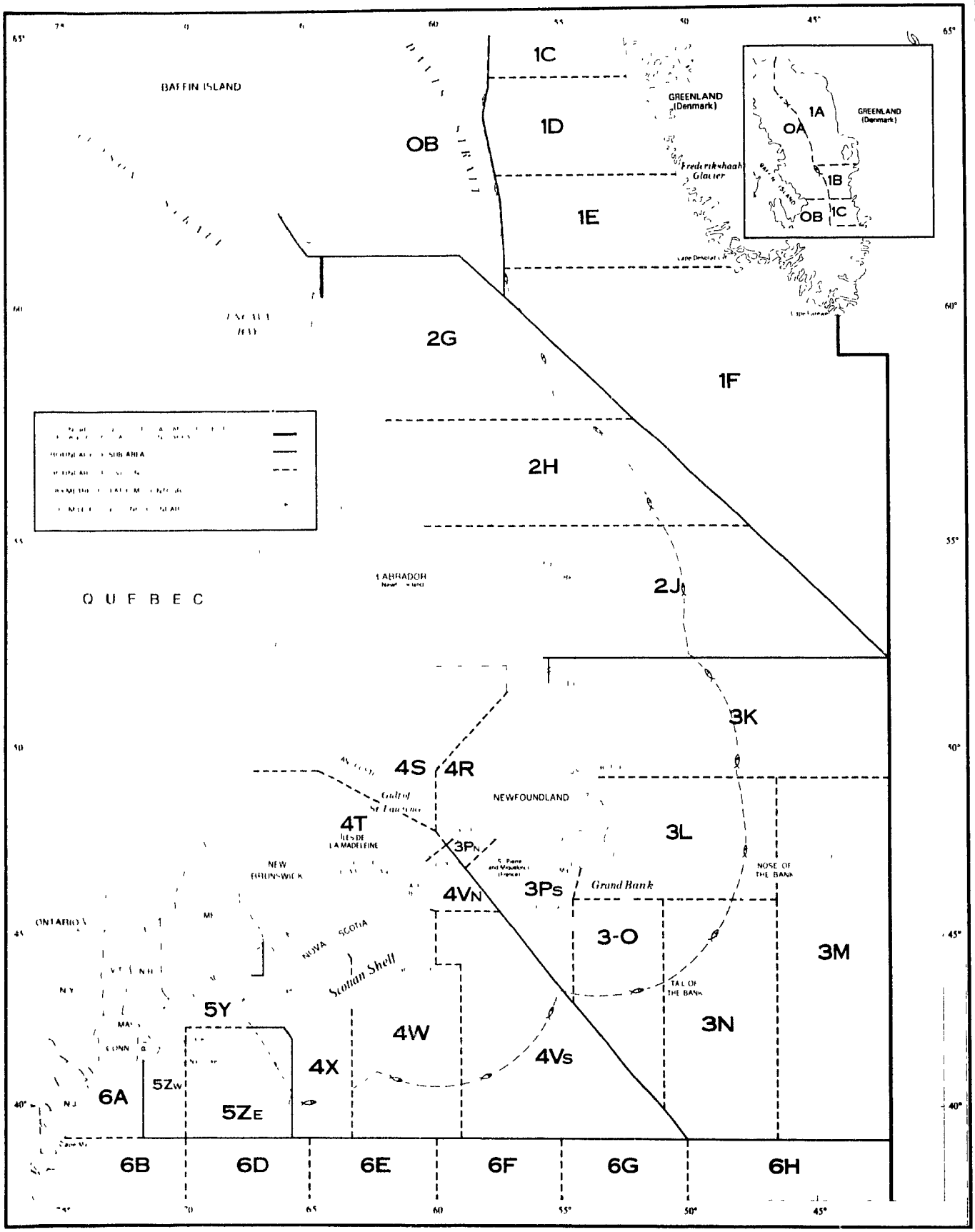
information and views relating to the Fisheries of the Convention Area and to encourage research". Its most visible function is to provide scientific advice to the Fisheries Commission and to coastal States where requested to do so. The Fisheries Commission is responsible for the management and conservation of the fishery resources of the Regulatory Area.

The NAFO Convention Area encompasses the waters of the Northwest Atlantic (Figure 6-11), including waters under national fisheries jurisdiction. The Regulatory Area is that part of the Convention Area which lies beyond the areas in which coastal States exercise fisheries jurisdiction. In practical terms, this means the Nose and Tail of the Grand Banks and Flemish Cap. The Convention applies to all fisheries resources with the exception of: salmon, tunas and marlins, cetacean stocks and sedentary species of the Continental Shelf.

Henceforth, when referring to NAFO I will be referring to the activities of the Fisheries Commission unless otherwise specified.

NAFO meets annually in September, the chief purpose being to establish management measures, particularly TACs and national allocations, for stocks in the Regulatory Area for the following year. These measures are adopted by a majority vote of the members of the Fisheries Commission, taking into account the advice received from the Scientific Council which meets annually in June. These decisions of the Fisheries Commission are communicated by the Executive Secretary to Contracting Parties who can, within 60 days, lodge written objections to any or all of the measures adopted by the Commission. If a member lodges an objection to any particular measure(s) it is not legally bound by that particular measure(s). The objection procedure, which is similar to that provided for in other international fisheries conventions, has become the Achilles' heel of NAFO. From 1985 onward the objection procedure was used repeatedly for a large number of

Fig. 6.11 Map showing NAFO convention area and statistical areas for the Northwest Atlantic.


BAFFIN ISLAND
GREENLAND (Denmark)
1C
1D
1E
1F
OB
2G
2H
2J
3K
3L
3M
3N
3O
3Pn
3Ps
4R
4S
4T
4Vn
4Vs
4W
4X
5Y
5Zw
5Ze
6A
6B
6D
6E
6F
6G
6H
1A
OA
1B
OB
1C
Frederikshaab Glacier
LABRADOR
QUEBEC
NEWFOUNDLAND
NEW BRUNSWICK
NOVA SCOTIA
ONTARIO
Gulf of St Lawrence
Grand Bank
Scotian Shell
NOSE OF THE BANK
TAIL OF THE BANK

stocks by one member, the EC. This use of the objection procedure imperilled the effective functioning of NAFO.

Following the formation of NAFO, Canada pursued three objectives:

1. Ensuring that management measures adopted for the Regulatory Area were consistent with the approach Canada was pursuing for adjacent stocks within its zone;
2. Ensuring that TACs were based on conservation requirements and aimed at rebuilding the stocks as quickly as possible; and
3. Securing for Canada preferential allocations of the stocks beyond 200 miles, particularly the straddling stocks, giving practical effect to the "special consideration" provision of the Convention.

With a few exceptions, Canada was successful in persuading NAFO to follow the conservative management regime it adopted for stocks within its zone. With the exception of Flemish Cap stocks which occur entirely beyond the Canadian zone, NAFO consistently established TACs at the $F_{0.1}$ level or its equivalent. Thus, Canada and the Fisheries Commission were able to agree on TACs for the seven straddling stocks. Similarly, Canada's identification of its needs for shares of the straddling stocks were largely accommodated by other NAFO members.

This approach characterized NAFO's deliberations from 1979 until 1985. The major difficulty from 1977 to 1983 was that one of the major participants in the fishery in the Regulatory Area, Spain, was not a member of NAFO and was fishing freely, ignoring the quotas ICNAF/NAFO was setting aside for Spain. This, plus increased activity by nonmembers, undermined NAFO's conservation efforts. Spain joined NAFO in 1983 and began to challenge its management approach and quota-

sharing arrangements. When NAFO continued the conservative management approach and sharing arrangements which had been in effect since 1977, Spain invoked the objection procedure and continued to fish freely in the Regulatory Area. Thus, Spain's membership in NAFO from 1983 to 1985 had no practical effect on its fishing activities.

The dynamics of NAFO changed dramatically at the Seventh Annual Meeting in Havana in September 1985. With the accession of Spain and Portugal to the EC imminent on January 1, 1986, the EC changed its NAFO position radically. This threw NAFO into a period of crisis.

Spain-Canada fisheries relations had been tense since 1977. Repeated attempts to negotiate a mutually satisfactory arrangement on conservation and fisheries trade matters ended in failure. Spain continued to fish freely outside 200 miles, ignoring NAFO quotas (Parsons, In Press).

Canada and the EEC had entered into a Long-Term Agreement on Fisheries (LTA) on December 30, 1981. This involved the provision of fishing quotas in Canadian waters, including non-surplus northern cod, to Community vessels in return for certain tariff rate quota benefits for specified fish products in the European market. Implementation of the LTA was fraught with difficulty. For details see Parsons (In Press).

In the winter of 1985 a new element entered into play to disrupt Canada-EC fisheries relations. After fishing their northern cod quota in the Canadian zone, FRG vessels encountered and began fishing concentrations of northern cod in 3L on the Nose of the Grand Banks outside the Canadian 200-mile limit, an area where increasing problems had been experienced with Spain.

EC negotiators by this time were being heavily influenced by the need to find fish for Spain and Portugal once they became members of the Community in 1986. Suspecting that Canada did not want the matter of the management of the northern cod stock brought before NAFO in September, the EC

chose to raise the matter there to exert maximum leverage on Canada and lead to significant concessions.

The 1985 meeting of NAFO was a stormy one. The EC challenged the Canadian view that 2J3KL cod should continue to be managed as one stock by Canada. It tried unsuccessfully to get NAFO to agree to set a TAC for 3L cod for 1986. Based on the existing lack of information concerning cod in Division 3L outside the Canadian zone, Canada argued that a fishery should take place only in the Canadian zone by Canadian vessels and those of other countries with allocations in Canadian waters. Canada proposed a one-year moratorium on fishing cod in 3L for 1986 which was adopted (NAFO, 1985).

The EC reversed its previous practice of supporting the scientific advice and instead launched an assault on the principles which NAFO used for establishing TACs. Supported by Spain and Portugal, it voted against proposed TACs for various stocks on the grounds that the scientific advice failed to provide options other than the $F_{0.1}$ reference point. The EC indicated that it would register a formal objection to all NAFO decisions including the 3L moratorium. In objecting to the TACs adopted, the EC would participate in fisheries for those stocks in 1986 and would adopt "management measures in accordance with the conservation principles underlying its policy and its assessment of the state of the stocks." (NAFO, 1985).

Thus the 1985 meeting marked a major turning point in the deliberations and functioning of NAFO. This pattern of conflict continued for the remainder of the 1980s. For details, see Parsons (In Press). The EC objected to the NAFO quotas for 1986 and subsequent years and established its own levels (Table 6-4). The moratorium on fishing cod in Division 3L was maintained by NAFO and ignored by the EC. The EC also established for the other stocks autonomous quotas higher than the quotas it was allocated by NAFO.

Table 6 4 Comparison of EC unilateral quotas (t), EC NAFO quotas (t) and EC catches (t) for NAFO Groundfish stocks and 2J3KL cod for 1986-1991

STOCK	1986			1987			1988			1989			1990			1991		
	EC UNILAT QUOTA	EC NAFO QUOTA	EC CATCH	EC UNILAT QUOTA	EC NAFO QUOTA	EC CATCH	EC UNILAT QUOTA	EC NAFO QUOTA	EC CATCH	EC UNILAT QUOTA	EC NAFO QUOTA	EC CATCH	EC UNILAT QUOTA	EC NAFO QUOTA	EC CATCH	EC UNILAT QUOTA	EC NAFO QUOTA	EC CATCH
3M COD	7,500	6,465	11,079	7,500	6,465	6,441	0	0	562	0	0	547	0	0	546	*6,465	*6,465	N/A
3NO COD	26,400	14,750	30,470	26,400	12,345	21,885	26,400	14,750	19,816	26,400	9,220	20,937	7,000	6,860	5,662	*5,016	*5,016	N/A
3M REDFISH		3,100	11,571		3,100	22,648	12,000	3,100	7,247	12,000	3,100	13,062	12,000	7,750	11,686	*7,750	*7,750	N/A
3LN REDFISH		0	23,388		0	28,186	20,000	0	12,699	20,000	0	6,346	6,000	0	5,120	6,000	0	N/A
3M A PLAICE		350	2,789		350	5,106	3,000	350	2,549	3,000	350	3,405	500	350	277	*350	*350	N/A
3LNO A PLAICE		700	21,161		610	17,014	9,000	510	9,828	6,820	385	11,595	500	317	643	*328	*328	N/A
3LNO YELLOW-TAIL		300	5,952		300	1,213	5,000	300	3,205	1,670	100	1,278	200	100	54	*140	*140	N/A
3NC WITCH		0	3,788		0	2,957	4,000	0	2,888	4,000	0	1,990	1,200	0	398	1,000	0	N/A
TOTALS	33,900	25,665	110,198	33,900	23,170	105,450	79,400	19,010	58,794	73,890	13,155	57,882	27,400	15,377	24,386	27,049	20,049	N/A
2J3KL COD	68,560	0	61,985[1]	76,400	0	35,392[1]	84,000	0	26,559	58,400[4]	0	35,594	32,000	0	21,912	27 000	0	N/A
GRAND TOTALS	102,460[2]	25,665	172,183	110,300[2]	23,170	140,842	163,400	19,010	85,353	132,290	13,155	93,476	59,400	15,377	46,298[3]	54,049	20,049	N/A

1 In 1986 and 1987, Canada allocated 9,500t of 2J3KL cod to the EC under the Canada-EC Fisheries Agreement.
2. EC did not set unilateral quotas for all stocks.
3 As reported to NAFO through May 1991 Figures are not complete
4. Amended by EC in July 1989 Set initially at 84,000t
* EC accepted NAFO decisions on these stocks

Source International Fisheries Directorate, Department of Fisheries and Oceans, Ottawa

Despite scientific warnings, the EC continued its efforts to have NAFO establish TACs at reference levels in excess of F_{01}. The EC indicated at the 1988 meeting that it intended systematically to object to any TAC not based on different management options provided by the Scientific Council and also in cases where the F_{max} level had not been selected even though it could have been. The EC intended to object to all NAFO decisions that "disregarded the legitimate socio-economic needs of the EC fleet" (NAFO, 1988a).

In 1988, Canada pointed out the excessive EC and nonmember catches stock by stock (see Tables 6-5 and 6-6). The EC's flagrant abuse of the NAFO objection procedure was clear. This plus the escalating fishing activity by nonmembers was eroding the authority and effectiveness of NAFO. The General Council adopted a resolution calling on "all Contracting Parties not to abuse the objection procedure against the regulatory measures adopted by the Fisheries Commission" (NAFO, 1988b). In December 1988, the EC announced unilateral fish quotas that were more than 12 times higher than the quotas NAFO had allocated to the EC (160,000 tons versus 13,000 tons) (DFO, 1988b).

In January 1989, advice received from CAFSAC indicated that earlier estimates of the size of the northern cod stock were in error and that the TAC at F_{01} for this stock should be in the order of 125,000 tons. This, combined with the decreased TACs for American plaice and yellowtail, led to increased pressure on Canadian authorities to deal effectively with the problem of EC flaunting of NAFO regulations. In 1989 Canada stepped up its efforts to reduce and eliminate foreign overfishing outside 200 miles. An intensive campaign involving Canadian Ministers, parliamentarians, and the fishing industry was launched to convince the EC and its member states to stop overfishing in the Northwest Atlantic.

Table 6.5 NAFO TAC overruns 1985-1990

	1985			1986			1987			1988			1989			1990		
SPECIES	TAC	EXCEEDED BY	%	TAC	EXCEEDED BY	%	TAC	EXCEEDED BY	%	TAC	EXCEEDED BY	%	TAC	EXCEEDED BY	%	TAC	EXCEEDED BY	%
3M COD	12,965	1,000	8 0	12,965	2,000	15 0	12,965	Not Exceeded	N/A	0	2,000		0	40,000		0	32,0001	
3NO COD	33,000	4,000	12 0	33,000	18,000	55 0	33,000	6,000	18 0	40,000	3,000	7 5	25,000	8,000	32 0	18,600	10 400 2	56 0
3M REDFISH	20,000	184	1.0	20,000	9 000	45 0	20,000	16,000	80 0	20,000	3,000	15 0	20,000	38,0003	190 0	50,000	33 0003	66 0
3LN REDFISH	25,000	Not Exceeded	N/A	25,000	17,000	68 0	25,000	19,000	76 0	25,000	18,0004	72 0	25,000	9,000	36 0	25,000	4,0004	16 0
3M A PLAICE	2,000	Not Exceeded	N/A	2,000	1,800	90 0	2,000	3,600	180 0	2,000	800	40 0	2,000	1,500	75 0	2,000	Not Exceeded	- -
3LNO A PLAICE	49,000	5,000	10 0	55,000	6,000	11 0	48,000	5,000	10 0	40,000	1,000 5,6	2 5	30,300	13,70056	45 0	24,900	7,100 5,6,7	28 5
3NO WITCH	5,000	4,000	80 0	5,000	4,000	80 0	5,000	3,000	60 0	5,000	1,000	20 0	5,000	Not Exceeded	- -	5,000	Not Exceeded	- -
3LNO YELLOWTAIL	15,000	14,000	93 0	15,000	16,000	107 0	15,000	1,000	7 0	15,000	1,0005	6 6	5,000	5,000 5,6	100 0	5,000	9,000 5,6,8	180 0

* NAFO SCS DOC 91/19

1 Includes estimates for non-members and Contracting Parties
2 Includes estimates for non-members and Contracting Parties (10,600t)
3 Includes estimates of unreported catch
4. Includes estimated catch for non-members who do not report to NAFO
5 Includes a percentage of the "Flounder not specified" catch reported to NAFO by South Korea
6 Includes estimates of catch based on surveillance reports
7 Includes estimates for non-members and Contracting Parties (8,100t)
8 Includes estimates for non-members and Contracting Parties (5,100t)

Source International Fisheries Directorate, Department of Fisheries and Oceans, Ottawa

Table 6.6 Unregulated fishery by non-members of NAFO

COUNTRY	NUMBER OF VESSELS						
	1984	1985	1986	1987	1988	1989	1990**
Cayman Islands	0	1	1	1	1	1	1
Korea	1	1	1	1	3	5	6*
Mauritania	0	0	1	0	1	1	0
Malta	0	0	0	0	0	1	1
Panama (Korean-crewed)	-	4	3	4	5	5	2
(European-crewed)	4	4	5	8	15	19	22
St. Vincents	0	0	0	0	1	1	1
USA	0	14	15	9	11	14	9
Mexico/Chile	6	6	4	6	4	0	0
Venezuela	0	0	0	0	0	0	2
TOTAL	11	30	30	29	41	47	44

* May include a squid fishing vessel registered in Taiwan

** Preliminary data

Source: International Fisheries Directorate, Department of Fisheries and Oceans, Ottawa.

This involved high level political discussions of the overfishing problem with EC leaders by the Prime Minister and various Ministers. A public information campaign was begun in Europe to highlight to European decision makers the environmental damage being caused by EC overfishing. Canada also initiated attempts to obtain international recognition of the special rights of coastal states with respect to the management of fish stocks that straddle 200-mile limits. (For a discussion of the legal options, see Applebaum, 1990). The government appointed Mr. Alan Beesley as Ambassador for Marine Conservation, with responsibility to coordinate Canada's efforts to resolve the problem of foreign overfishing.

The EC adopted a less confrontational approach at the 1989 meeting, abstaining on most NAFO management proposals rather than voting against them, but without indicating an intention to comply with NAFO management decisions in 1990. The TACs for the ten stocks managed by NAFO were set for 1990 on the basis of advice from the NAFO Scientific Council and were consistent with the principles followed by Canada inside the 200-mile zone. The moratorium on fishing for cod in 3L in the Regulatory Area was continued for 1990,with the EC again opposing the proposal (NAFO, 1989).

In December 1989 the EC's Council of Ministers established unilateral quotas of 59,400 tons for 1990 compared with EC NAFO quotas totalling 15,377 tons. This compared with initial EC unilateral quotas for the same stocks totalling 157,890 tons in 1989. While the discrepancy between the EC's unilateral quotas and the EC's NAFO quotas was narrowed, much of this was a "paper" reduction since the EC's reported catch had declined from 172,000 tons in 1986 to 64,000 tons in 1989. On the key issue under dispute, the fishery for northern cod in 3L, the EC unilateral quota of 32,000 tons was higher than its 1989 catch and roughly equivalent to the average of the reported catches in 1987 and 1988 (Table 6-4).

For three stocks there was apparent progress, on paper- 3NO cod, 3LNO American plaice, 3LNO yellowtail flounder. For these the 1990 unilateral quotas amounted to 7,700 tons compared with NAFO assigned quotas of 7,277 tons and recent catches by the EC fleet from these stocks of 20,000-30,000 tons. NAFO had reduced significantly the TACs for these stocks for 1990 because their abundance had been reduced by overfishing.

At the 1990 NAFO meeting the EC voted with Canada and the majority in setting TACs and allocations for seven of the ten NAFO stocks but abstained on three stocks (3M cod, 3LN redfish and 3NO witch flounder). NAFO again agreed to a continuation of the moratorium on fishing cod in 3L, with the EC voting against (NAFO, 1990a).

In December 1990 the EC adopted quotas for the NAFO Regulatory Area for 1991. It accepted the NAFO quotas for the EC for seven out of ten stocks. It reduced its unilateral quota for cod in 3L slightly to 27,000 tons. It established unilateral quotas for two straddling stocks - 3LN redfish and 3NO witch - even though NAFO had not set aside any share for the EC from these stocks. While the EC had moved some distance towards adoption of NAFO quotas, its unilateral quota for 3L cod remained a major stumbling stock to ending the Canada-EC-NAFO confrontation.

In February 1991, Canada released Canadian estimates of 1990 catches by EC vessels in the Northwest Atlantic outside the 200-mile limit. EC vessels were estimated to have caught about 76,000 tons of NAFO-managed groundfish stocks (not including northern cod). This was five times greater than the quotas, totalling 15,377 tons, voted by NAFO members for the EC. These catches were also far in excess of the unilateral quotas totalling 27,400 which the EC had set for 1990 (DFO, 1991a).

In addition, Canada estimated that EC vessels in 1990 took 21,800 tons of northern cod in 3L. Also in 1990 the EC

caught 32,000 tons of Greenland halibut in 3L, a new fishery outside 200 miles for this species.

By mid-1991 foreign overfishing of straddling stocks was still a major problem. While the EC had made some conciliatory moves towards resolving the confrontation with Canada begun in 1985, it was by no means clear what long-term solution to the management of the straddling stocks, particularly northern cod, would emerge. The large-scale diplomatic and public relations campaign mounted by Canada in 1989 and 1990 had had some positive impact but eliminating the problem of foreign overfishing, both by members and non-members of NAFO, remained a major challenge.

4.2. Protection of Canadian-Origin Anadromous Stocks Beyond 200 Miles

A second major Canadian objective at UNCLOS III was the protection of anadromous stocks of Canadian origin beyond 200 miles. On the east coast salmon stocks of North American (primarily Canadian) and European origin were exploited at West Greenland. On the west coast, there was continuing concern about the potential for increased exploitation of Canadian - origin salmon on the high seas. There were also difficult and prolonged negotiations to establish a framework for managing Canadian and U.S. interceptions of Pacific salmon originating in each other's waters. The Atlantic salmon problem was addressed through the formation of a new North Atlantic Salmon Conservation Organization (NASCO) and the Pacific high-seas-interception problem through renegotiation of the International North Pacific Fisheries Commission (INPFC). More recently (1992) a broader agreement involving countries who fish salmon in the North Pacific or catch salmon incidentally in drift nets used to fish other species has been negotiated.

NASCO has since 1984 provided some protection for salmon of Canadian-origin harvested at West Greenland. Given the

unanimity provisions of the Convention establishing NASCO, the degree of agreement achieved during the 1980s was remarkable. In 1991, a group of international organizations agreed with Faroese fishermen on a buy-out of the Faroese salmon quotas for 1991 to 1993. This may be followed by some similar arrangement for the West Greenland fishery. Despite the drastic conservation measures adopted by Canada from 1984 onwards and the reduction in the West Greenland quota, Canada's Atlantic salmon stocks at the beginning of the 1990s continued to experience poor returns in many river systems (Parsons, In Press). In March 1992 Fisheries Minister Crosbie announced a five-year closure of the commercial salmon fishery on the island of Newfoundland.

On the Pacific coast, the problem of interception of Canadian-origin salmon in the high seas directed fishery for salmon by Japan was largely eliminated during the 1980s as the Japanese fishery was moved further westward and curtailed. The development of a major high seas driftnet fishery for squid by Japan and various South Pacific nations posed a new unquantified threat through the incidental capture of salmonids. Also some vessels fishing squid move into areas where salmon occur and target salmon (John Davis, DFO, Pacific Region, Personal Communication). Two international meetings in 1991 on the impact of these driftnet fisheries helped to quantify the interceptions of salmon in fisheries targeted at other species. Implementation of the 1989 and 1990 United Nations General Assembly resolutions proposing a moratorium on high seas driftnet fisheries by the end of June 1992 by the countries whose activities appear to pose the greatest threat in the North Pacific is a major step forward.

In February 1992 the USSR, the U.S., Canada and Japan signed a new Convention for the Conservation of Anadromous Stocks in the North Pacific. This Convention prohibits directed fishing for anadromous species in the waters of the North Pacific north of 33^0 North Latitude beyond the 200-mile

zones of the signatories. The Parties agreed to minimize the incidental take of anadromous species in fisheries for other species. The Convention provided for a new North Pacific Anadromous Fish Commission to replace INPFC. Thus at the beginning of the 1990s new mechanisms were put in place to address the problem of interception of Pacific salmon on the high seas of the North Pacific.

4.3. Bilateral Fisheries Relations

In the post-extension era many of the most critical problems of international fisheries management concern Canada's bilateral fisheries relations with its neighbours. A number of stocks straddled the boundaries or claimed boundaries between Canada and its neighbours. As part of the worldwide trend, Canada's neighbouring coastal states, the USA, France (with respect to St. Pierre and Miquelon), and Denmark (with respect to Greenland), also extended fisheries jurisdiction in 1977. In a number of areas there were major overlaps between the 200-mile zone claimed by Canada and those claimed by its neighbours, particularly the claims of the USA and France.

Some general observations on Canada's fisheries relationships with its neighbours in the post-extension era follow. More details can be found in Parsons (In Press).

The post-extension history of Canada's fisheries relationships with its neighbours is a chequered one. Fourteen years after extension, only two of Canada's six maritime boundaries with its neighbours have been resolved . One of these, that with Denmark (Greenland), was delimited in 1973 by mutual agreement, prior to the 200 mile zone. The second, the Gulf of Maine boundary, was achieved through third party adjudication by the International Courts of Justice at the Hague in 1984. A third, that with France (St. Pierre and Miquelon), was referred in 1989 to third party arbitration. The remaining three boundaries with the U.S.A - Juan de Fuca Strait, Dixon Entrance and the Beaufort Strait - are less

significant in fisheries terms and immediate resolution is less critical.

In general, the attempts to delimit the maritime boundaries through bilateral negotiation suggest that third party adjudication of one form or another is the preferable, if not the only, route to pursue. In the case of the Gulf of Maine and the area to the south of Newfoundland, there was clearly too much at stake for either party to be prepared to back away from its claim. Because of the sovereignty linkage it is difficult for either country to be seen as yielding its national interest to the other. The decision in the Gulf of Maine case raises some interesting questions about the criteria for delimiting a multi-purpose single maritime boundary. For a discussion of this judgement, see McRae (1983), Legault and McRae (1984), McHugh (1985), McDorman *et al* (1985), Legault (1985), Schneider (1985), Pharand (1985), Clain (1985), Terres (1985), Legault and Hankey (1985), Cooper (1986), and Johnston (1988).

With respect to the management of transboundary resources, again the record is chequered. The initial promise of reciprocal fisheries arrangements with the EC, on behalf of Denmark/Greenland in Davis Strait during the period 1977 to 1980, dissipated quickly in the face of greed and differences of approach to the management of transboundary resources. The EC's refusal to abide by an agreement negotiated in good faith set the stage for a breakdown of the reciprocal fisheries arrangements in 1981. In this particular case, given the limited nature of the resources involved (shrimp being the only one of mutual interest), the erection of separate management regimes on the two sides of the boundary does not appear to have had an adverse impact on either the living resources or the fisheries for those resources. Recent developments in the northern shrimp fishery and the management approaches of the two parties suggest that some convergence of management approaches may be possible in the next decade, with

a return to some form of cooperative management (Parsons, In Press).

Attempts to put in place transboundary resource management arrangements with the United States have been less than satisfactory. An East Coast Fishery Agreement negotiated in 1979 would have established a comprehensive management framework for the major transboundary resources in the Gulf of Maine area, particularly on Georges Bank. The successful efforts by various groups in the U.S. east coast industry to derail the Agreement and prevent its ratification by the Senate came back to haunt them in the form of a boundary decision assigning a significant portion of Georges Bank to Canada. Developments since then suggest that both sides may have been better off had the 1979 Agreement been ratified and implemented.

Resource declines in the Georges Bank-Gulf of Maine area during the past few years underline the folly of attempting to manage transboundary resources in a manner which ignores their transboundary nature. Fishermen of both countries are suffering as a consequence but U.S. fishermen more so. The different management approaches of Canada and the New England Regional Council represent a considerable obstacle to cooperative management. Unless there is some evolution in the New England fisheries management regime towards a system of limiting fishing effort, there would appear to be little prospect of reversing the detrimental aspects of the current bifurcated approach. Recently, there have been signs that some re-thinking is occurring within the New England industry (V. Anthony, National Marine Fisheries Service, Woods Hole, Massachusetts, Personal Communication).

With the exception of the impact on Canadian halibut fishermen, the termination of reciprocal fishing arrangements on the Pacific coast does not appear to have had a major impact on non-salmon fishermen. The halibut fishermen suffered by their displacement from traditional fishing

grounds off Alaska. However, maintenance of the International Pacific Halibut Commission has fostered continued cooperation in resource management.

With respect to Pacific salmon, the 1985 Canada-USA Pacific Salmon Treaty marked the beginning of a new era of cooperative management between Canada and the United States. The initial signs are encouraging that the regime put in place under this Treaty will foster stock rebuilding and promote the more equitable balance in salmon interceptions that Canada had been seeking for some decades. Major problems remain but at least there is a comprehensive framework in place through which they can be addressed in a spirit of cooperation. This stands in stark contrast to the fence-building on the East Coast precipitated by the U.S. rejection of the 1979 Agreement.

Canada's fisheries relations with France (both Metropolitan France and St. Pierre and Miquelon) in the post-extension era have been complicated by the existence of a treaty, the 1972 Agreement, signed before the global wave of 200-mile zones and, indeed, in advance of the widespread adoption of a management system relying on catch quotas. Relations with France were reasonably amicable in the initial 7-8 years following the proclamation of 200-mile zones by Canada and France. The considerable overlap in the claimed areas of fisheries jurisdiction did not pose any immediate problems because of a gentlemen's agreement on catch quotas, national shares and flag state enforcement in the disputed zone. Relations deteriorated in 1984 and 1985 when France began to ignore previous understandings and increased significantly its cod catches in Subdivision 3Ps. This was triggered, to a large extent, by the imminent phase out (May 15, 1986) of Metropolitan France trawlers from the Gulf of St. Lawrence. The lack of a defined boundary set the scene for confrontation. Again it was not possible to arrive at a negotiated boundary delimitation. Referral of the boundary

dispute to third party arbitration and agreement on an interim package of fisheries quotas calmed the waters temporarily. The prospects of negotiating cooperative resource management arrangements, once the boundary is settled, are unclear.

These experiences have demonstrated that the goal of cooperative management of transboundary resources is more elusive than the drafters of the 1982 Law of the Sea Convention envisaged. Where the fisheries management systems of two countries differ radically, as in the case of Canada and the United States on the East Coast, this task is even more difficult.

5. BOOM AND BUST - RIDING THE ROLLER COASTER

5.1. General

Many observers have noted the characteristic boom and bust patterns which have plagued Canada's marine fisheries for decades, indeed centuries. This pattern has been particularly evident in the Atlantic groundfish fishery. Similar boom and bust phenomena have been documented for other species and other geographic areas. There is no one dominant pattern which describes these up-and-down surges for all species and areas. Because of the diverse nature of the Canadian fisheries and the often-unpredictable fluctuations in the resource base, the periods of prosperity and downturn differ from fishery to fishery. An underlying instability continues to plague Canada's marine fisheries, despite the best efforts of governments, Royal Commissions, Task Forces, and other groups to identify causes and suggest solutions.

Resource variability is only one of the factors contributing to instability in the Canadian fishery. Another major factor has been dramatic swings in the market demand and prices for certain products. The wild swings in the market for Pacific roe herring in the mid-1970s are a good example of this. With the revival of the herring fishery in the 1970s, a major new fishery product, herring roe, developed for export

to Japan. British Columbia became the principal supplier of this product to Japan with the collapse of Chinese herring roe production. Traditionally, salmon had accounted for more than 80 percent of the market value of the B.C. fishery. By 1979, with the development of the roe herring fishery, salmon contributed just over 50 percent of the value and herring roe almost 35 percent. Herring landings had peaked in 1977 but landed value peaked sharply in 1979. This occurred because of the dramatic increase in prices received for roe herring in 1977, 1978 and 1979. In 1978, Japanese companies such as Mitsubishi and Marabeni and other smaller firms paid as much as $3,000 a ton, cash on the fishing grounds, for roe herring. In 1979, price resistance developed in Japan. This led to a drop in the prices paid to B.C. fishermen for roe herring. Faced with dramatically reduced prices, in 1980 union fishermen refused to fish for herring. As a consequence, landings dropped to 25,000 tons and the market value of herring dropped to less than 20 percent of its previous high (Figure 6-5). 1980 was also a poor year for salmon, with landings dropping to 54,000 tons and landed value to $117,000,000 (Figure 6-4). As a result, the overall market value of the B.C. fishery declined by almost 40 percent and until 1985 remained less than two-thirds of the previous high (Figure 6-12).

These circumstances in the B.C. herring and salmon fisheries, combined with an overinvestment in the fleet in the late 1970s, constituted a crisis for fishermen. There were excessive inventories of Pacific canned salmon. Following the 1979 herring bonanza, 1980 roe herring prices collapsed from $1.34 per pound to 52 cents per pound. As a result, fishermen faced a severe economic squeeze. While market prices and earnings were decreasing, costs of production increased and interest rates soared. This meant that fishermen were unable to repay their investment in vessels, gear and equipment. From 1980 to 1984, fishermen were confronted by loan defaults,

boat arrests, repossession and forced sales (Pacific Region staff, DFO, Personal Communication).

Thus, boom conditions in the late 1970s were followed by a bust in the early 1980s. Participants in the B.C. fishery faced bankruptcy. Those who survived experienced an upswing again from 1985 onward as landings and landed values reached record levels. By 1991 the B.C. salmon industry again faced an uncertain market. These ups and downs in the B.C. fishery were similar in some respects to the upheavals that have occurred in the Atlantic groundfish fishery over the past three to four decades.

5.2. Atlantic Groundfish

The fishery for Atlantic groundfish is the dominant fishery on the Canadian Atlantic coast. It is export-oriented and particularly dependent on the U.S. market. Over the past two decades the fresh and frozen segment of the Atlantic groundfish fishery experienced several major crises at intervals of approximately 6 to 8 years. There were downturns in 1967-68, 1974-75, 1980-81 and again in 1989-90.

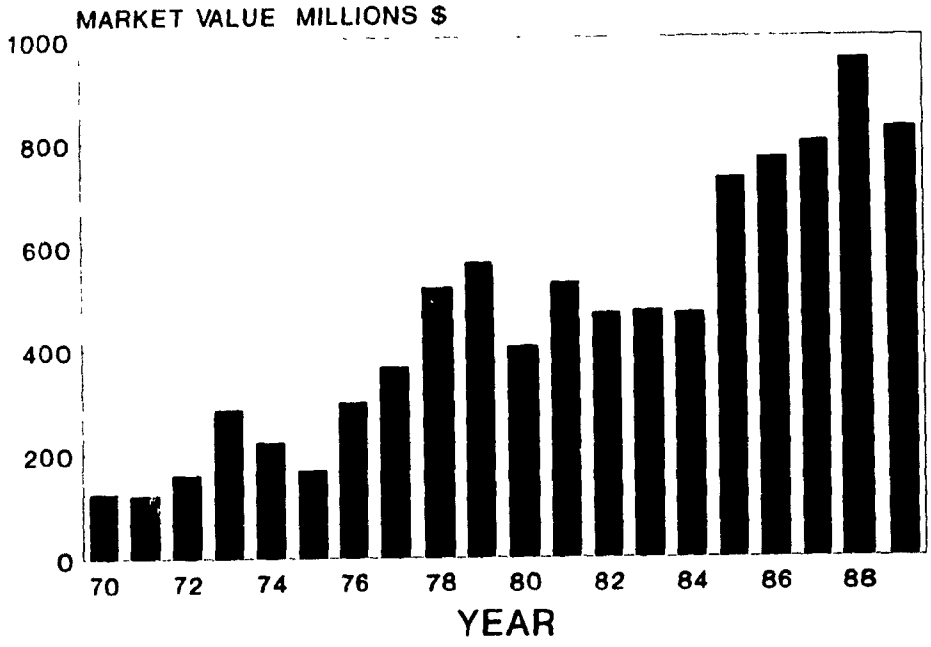
5.2.1. The Period from 1950 to the Mid-1960S

The Annual Reports of the Fisheries Prices Support Board generally contain a short section on economic conditions in the Canadian fisheries for the year under review. An examination of these reports gives some idea of trends in market conditions and prices during the 1950s and 1960s.

From the FPSB Reports, there would appear to be little evidence of any serious crisis in the frozen segment of Atlantic groundfish industry during the 1950s. There was a slight downturn in 1952-53 but this was relatively modest and insufficient to warrant intervention by the Fisheries Prices Support Board. There were problems during the 1950s but these related generally to a general decline in the saltfish

Fig. 6.12 Trends in Market Value of the British Columbia Fisheries, 1970-1989.

Source: DFO Statistics, Ottawa.


MARKET VALUE MILLIONS $
1000
800
600
400
200
0
70
72
74
76
78
80
82
84
86
88
YEAR

industry and "poor years" in the Newfoundland inshore cod trap fishery. The saltfish industry, which had been the primary market outlet for centuries, was on the decline.

With respect to the fresh and frozen groundfish industry, the FPSB reports indicate that the years 1957 to 1965 were generally favourable. There was a minor market downturn in the winter of 1959-60. There is no evidence to support the suggestion that the slight market downturns in 1952-53 and 1959-60 represented significant groundfish crises comparable to those which occurred in the 1960s, 1970s and 1980s.

The years from 1961 to 1965 were characterized as good years for the Atlantic groundfish industry, even though the seeds for later crises were being sown in the form of the build-up of a massive foreign fishery off the Canadian Atlantic coast. Declines in stock abundance and catch rates were not felt until the late 1960s and early 1970s. Between 1960 and 1963 the value of exports of fishery products increased by 25 percent. Part of this was due to depreciation of the Canadian dollar but a significant part was due to higher unit prices in the U.S. and other markets.

5.2.2. The 1967-69 Groundfish Crisis

In 1966, new records were achieved both in quantity and value of landings. However, there was a significant price decline in the U.S. market for some products in the autumn of 1966, particularly Atlantic groundfish. High inventories depressed prices which had dropped 25 percent from the mid-1966 price by April 1967.

In 1967 the problem which had emerged late in 1966 worsened. The oversupply situation which began to develop in the U.S. market during the summer of 1966 contributed to weak market conditions during the remainder of 1966 and throughout 1967. All types of groundfish fillets and blocks were affected, but cod blocks were affected most. U.S. imports of groundfish fillets decreased.

In 1968, the groundfish market again weakened in the U.S., particularly for cod and redfish. The price of cod blocks decreased from 26 cents (U.S.) per pound in January 1968 to 24 cents in May and 21 cents by July, similar to the low of March 1967. Thus the recovery of late 1967 was short-lived.

These market downturns in 1966-68 constituted the first significant crisis in the frozen groundfish segment of the Atlantic fishing industry. In May, 1968, the federal government commenced a program of deficiency payments to fishermen through the producers of selected frozen groundfish products in the Atlantic. These deficiency payments were intended to maintain prices to fishermen at or above the levels which prevailed during the previous year. Prices continued to be weak during the first nine months of 1969.

In May, 1969, the FPSB launched a frozen groundfish stabilization program with the objective of forestalling distress selling in normal markets and to raise the market price of selected groundfish products to a point where basic costs were covered. In late spring the price for cod blocks was around 21 cents (U.S.) per pound. By the end of 1969 the market price for cod blocks had increased to 26-27 cents per pound. The initial cost of this program was $4.2 million, which was recovered from the industry when the inventory was returned to them.

The crisis in the saltfish sector was more critical. This period was the beginning of the end of this segment of the industry (Alexander, 1977; Ryan, 1986). A very significant response to the 1967-69 groundfish crisis was the establishment of the Canadian Saltfish Marketing Corporation.

5.2.3. A Brief Recovery - 1970 to 1973

By 1970 the Atlantic groundfish industry appeared to have recovered from the market downturn of 1966 to 1969. Groundfish landings were declining due to the impact of

foreign overfishing on the groundfish stocks, but demand exceeded supply, resulting in higher prices. From September to December of 1970, prices of cod blocks increased dramatically from 30 cents per pound (U.S.) in September to 40 cents in December. Cod block prices again increased from 40 cents (U.S.) per pound in January 1971 to 45 cents per pound in December 1971 and reached 48 cents per pound by the end of 1972.

In 1973, prices for groundfish products increased substantially. Cod blocks rose to 80 cents per pound, an increase of 31 cents per pound during the year. This was a dramatic increase, when one considers that the price at the beginning of 1970 was around 27 cents per pound. Market demand was growing at a time when supply was decreasing. Because of the greatly increased market prices, the landed value increased by 13 percent in spite of a decline in landings.

5.2.4. The 1974-76 Groundfish Crisis

The 1973 boom conditions were short-lived. Catch rates of Canadian otter trawlers had been declining since the mid-1960s (Figure 5-3). The effect of the declining catch rates was to increase significantly the cost of catching fish. Furthermore, in 1973 a major oil crisis occurred when the Organization of Petroleum Exporting Countries (OPEC) abruptly increased the world price of oil. This increased significantly the fuel costs of Canadian Atlantic groundfish fishermen, particularly in the offshore sector.

Faced with a situation of rapidly increasing costs, the industry was ill-prepared for the market downturn which occurred in 1974. Cod block prices which had been 80 cents (U.S.) per pound at the end of 1973 decreased to 60 cents per pound by July 1974. Average groundfish export prices declined by about 20 percent. In 1974, total U.S. groundfish consumption decreased 20 percent from the 1973 record consumption.

By mid-1974 the boom conditions of 1973 were replaced by a major crisis in the Atlantic groundfish industry. The industry faced a cost/price squeeze of major proportions. Industry leaders appealed to the government for assistance to ensure the survival of the groundfish industry. On July 17, 1974, the federal government authorized the provision of working capital loans and assistance for inventory financing

and product promotion at an estimated cost of $10 million. In November 1974, this program was extended to the end of March 1975 at an estimated cost of $4.5 million (DOE, 1974a). At the same time Fisheries Minister LeBlanc announced the appointment of a Task Force led by Mr. Fern Doucet, Chairman of the Freshwater Fish Marketing Corporation, to examine the causes of the groundfish crisis and to recommend long-term measures for the rehabilitation of the industry.

On December 20, 1974, Minister LeBlanc announced a further $20 million in assistance for the industry "as a first step towards the rehabilitation of the Canadian groundfish industry" (DOE, 1974b). This was intended to keep the groundfish fleets in operation during the winter months while longer term solutions were being sought.

On April 23, 1975 Minister LeBlanc announced a new $51 million "bridging" program of assistance. The new "bridging" program included for the first time direct assistance to fishermen. The program had several components:

1. $27 million for deficiency payments directly to groundfish fishermen of 2.5 cents per pound for first quality fish;
2. $14 million for conditional grants to processors of first-quality frozen groundfish fillets and fillet blocks (eight cents per pound of finished product) and first quality fresh groundfish fillets within Canada, provided processors maintained the basic price to fishermen paid on July 1, 1974;
3. $600,000 for deficiency payments to crab fishermen ($300,000) and to crab processors ($300,000); and
4. A collection of other small-scale deficiency payments to freshwater water fishermen and purchase of lobster inventory, mackerel, herring, gaspereau and groundfish for food-aid and development programs." (DOE, 1975e)

In the latter half of 1975 market conditions improved somewhat. The high inventories held in Canada at the beginning of 1975 were reduced to more normal levels by year-end. While the demand and prices for cod blocks remained sluggish there was an improvement in market demand and prices for most groundfish products during the last six months of 1975. Demand and prices for flounder and redfish strengthened. The U.S. consumption of groundfish fillets and cod blocks increased by 17 percent compared with 1974.

Despite these improvements, Fisheries Minister LeBlanc announced on March 5, 1976, a further $44 million temporary assistance program (TAP) effective April 1, 1976, a successor to the Bridging Program (DOE, 1976e).

In May 1976, the federal government released a new Policy for Canada's Commercial Fisheries (DOE, 1976b). While it recognized that resource overexploitation, rising costs and a market downturn had combined to produce the 1974-75 Atlantic groundfish crisis, this policy document also laid part of the blame on certain structural defects in the industry. The perceived defects included overcapacity of capital and labour in relation to resource availability, and inefficient distribution of capacity in terms of location and adaptability. This overcapacity had resulted from competition among fleet owners and fish buyers for a dwindling supply of groundfish, abetted by programs of public assistance (loans and subsidies) for vessel construction. There was also overcapacity in the processing sector.

The 1976 Policy proposed two major shifts in policy:

"1. The guiding principle in fishery management no longer would be maximization of the crop sustainable over time but the best use of society's resources. 'Best use' is defined by the sum of net social benefits derived from the fisheries and the industries linked to them.

"2. While private enterprise, individual, cooperative and corporate, would continue to predominate in the commercial fisheries, fundamental decisions about resource management and about industry and trade development would be reached jointly by industry and government."

Market conditions improved considerably for most Canadian fishery products during 1976. The overall market value increased by 42 percent compared with that of 1975. There was a strong upward trend in prices for a wide range of groundfish products. Demand was buoyant throughout the year for fishery products generally and for groundfish fillets and fillet blocks in particular. Cod block prices in the Boston market increased from about 60 cents at the end of 1975 to the 87-88 cents (U.S.) per pound range by the end of 1976.

5.2.5. Apparent Prosperity - 1977-79

Extension of jurisdiction in January 1977 provided the opportunity for resource rebuilding and the promise of a brighter future. With the exception of some problem areas (side trawlers and difficulties associated with specific plants), the industry was beginning to return to profitability.

Canadian Atlantic groundfish catches reached 515,000 tons in 1977, up 10 percent from 1976 and 23 percent from the low of 418,000 tons in 1974. There were substantial increases in catches of cod, haddock and turbot. Redfish catches, on the other hand, were down as the result of the substantial decline in the Gulf of St. Lawrence redfish fishery (Figure 6-13). Overall, the increase in gross returns to primary producers of groundfish was close to 30 percent above 1976 levels (FPSB, Annual Report, 1977-78).

The assistance program of 1975-76 and 1976-77 was a rescue operation and was credited with helping the core of the Atlantic groundfish fishery survive until the resource supply

and market conditions improved. Overall, during this period more than $170 million in special aid was authorized just to keep the industry alive. That special aid worked out to about $8,500 for every fishing enterprise or $2,900 for every fisherman across Canada. The bulk of the money, however, went into sectors of the Atlantic fisheries.

The need for restraint in harvesting and processing capacity and for orderly marketing was soon forgotten as the stocks and markets continued to recover. Fishermen, processors and some provinces were soon swept up by the euphoria of the 200-mile limit and the perceived benefits of displacing foreigners in many fisheries.

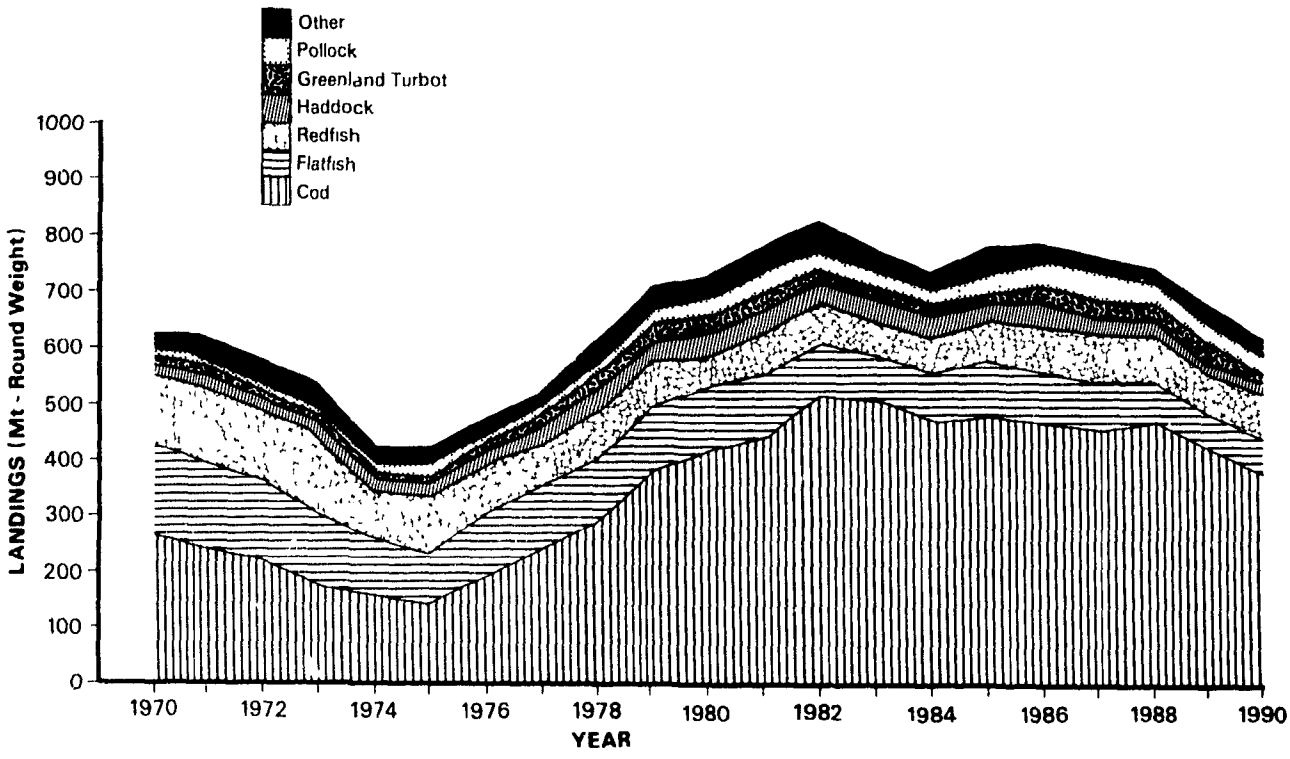
Scientific and economic analyses suggested that the first priority was to better utilize existing harvesting and processing capacity and put it on a viable basis (DOE, 1978a; Blackwood, 1974). Despite this, some segments of the fishing industry and the provinces of Nova Scotia and Newfoundland began to develop ambitious plans for fleet and onshore plant expansion. The $900 million fleet development proposal of Newfoundland and Nova Scotia generated considerable pressure on the federal government to permit expansion of the offshore fleet. Two of the five major vertically integrated companies involved in the Atlantic groundfish fishery launched a major propaganda offensive criticizing the cautious approach of the federal government and calling for major changes in policy to allow fleet expansion in particular (Nickerson and NSP, 1978).

At the 1978 meeting of the Fisheries Council, Fisheries Minister LeBlanc confronted the fleet expansion issue head-on: "The present groundfish fleet of larger vessels has the capacity to take half again its present catch, and provide better incomes - if we increase the fish in the water and the catch rates. If we do it the other way around - increase the fleet first - we are like a man with an exhausted woodlot, who instead of planting more trees to get more growth, spends all his money on more

Fig. 6.13 Trends in Canadian Atlantic groundfish catches, 1970-1990.

Source: DFO Statistics, Ottawa

CANADIAN ATLANTIC GROUNDFISH CATCH BY SPECIES



chain saws to cut the shrubs. Massive fleet expansion at the moment would be a Titanic undertaking - and I use the word advisedly...." (DOE, 1978d)

Unfortunately, Minister LeBlanc's prophetic words fell on deaf ears. While he was able to prevent expansion of the offshore trawler fleet, he moved too late to prevent the development of overcapacity in the inshore fleet. Meanwhile, there was a significant expansion of onshore processing capacity, particularly in Newfoundland. Several large companies, particularly H.B. Nickerson & Sons Limited, took on a heavy debt load to fund this expansion. The number of federally registered fish plants in the Atlantic provinces increased from 519 in 1977 to 700 in 1981, a 35 percent increase. In Newfoundland the number of plants increased from 147 in 1977 to 225 in 1981 (DFO, 1982b). Much of the excess capacity was concentrated in a few relatively large plants.

This expansion occurred during a period when the resource was recovering. The Canadian Atlantic groundfish catch increased by approximately 100,000 tons in 1978, a 19 percent increase over 1977. It continued to increase to 1982 when it peaked at 820,000 tons, almost double the level of catch in 1974. This increase was primarily driven by cod catches which increased from 146,000 tons in 1975 to 517,000 tons in 1982, a 350 percent increase in just six years (Figure 6-11). More importantly in terms of fleet profitability, the catch per day fished of the Canadian offshore trawler fleet increased sharply from approximately 8.5 tons per day in 1977 to almost 14 tons per day in 1981 and 1982, the highest catch rates since the 1950s (Figure 5-3).

Market conditions for Atlantic groundfish products were also favourable through the late 1970s. As an example, U.S. cod block prices increased from 60 cents (U.S.) per pound at the end of 1975 to 88 cents at the end of 1976, $1.00 at the end of 1977, stayed at $1.00 in 1978, reached $1.05 at the end

of 1979 and stabilized at the $1.05 - $1.15 (U.S.) range during 1980 and 1981.

5.2.6. The 1980-82 Crisis

Despite these favourable factors, the Atlantic groundfish industry again plummeted into crisis during the Great Recession of the early 1980s. The seeds of this crisis had been ripening for some time but, since there was no ongoing monitoring of the economic pulse of the fishing industry, it came as a shock to government.

By late 1981 it became apparent that two of the five vertically integrated groundfish companies - The Lake Group in Newfoundland and H.B. Nickerson & Sons Ltd. with plants in both Nova Scotia and Newfoundland - faced a severe financial crisis. Although there were some signs of the emerging crisis as early as 1980, there was no public evidence of this. The only publicly-traded company, National Sea Products, had reported profits of almost $20 million in 1978 and 1979.

Market difficulties and the high costs of financing short-term debt resulted in plant closures, vessel tie-ups and requests for assistance beginning in mid-August 1981.

Representatives of the Lake Group, H.B. Nickerson & Sons and the Bank of Nova Scotia, the major industry creditor, informed various federal departments, including DFO and the Department of Finance, that major segments of the industry were on the verge of bankruptcy unless massive government financial assistance was forthcoming.

Against this background, on January 8, 1982, the Prime Minister announced the formation of the Task Force on Atlantic Fisheries under the chairmanship of Michael Kirby with a mandate to "inquire into and report upon the current conditions and future direction of the Atlantic Coast fisheries" and to "report to the ad hoc Committee of Ministers on how to achieve and maintain a viable Atlantic fishing

industry, with due consideration for the overall economic and social development of the Atlantic provinces" (Canada, 1982).

In its report, released in February 1983, the Task Force analyzed the financial condition of the processing sector based on a study by Woods Gordon of some 100 processing enterprises. The Woods Gordon study revealed that in 1981 the enterprises surveyed incurred a consolidated loss of $57 million, following a loss of $22 million in 1980.

While the financial downturn was widespread, it was most severe in the frozen groundfish and herring sectors. Simplistically stated, the crisis was the result of costs rising more rapidly than revenues. Unlike 1974, resource abundance was increasing and hence resource supply was not a factor in this 1980-83 crisis. 1978 was the most profitable year since extension of jurisdiction and 1981 the least.

The Task Force summed up the cause of the 1980-81 downturn as follows:

> "The extremely strong price performance of fish products between 1969 and 1978, interrupted only in 1974-75, compounded by the declaration of the 200-mile limit and the rapid increase in Atlantic coast landings, created extraordinary optimism in the industry, in governments and in the financial community. The optimism together with the inevitable competition among stake holders to be the first to take advantage of the 200-mile limit, accounts for the surge in investment and employment in the fishery between 1977 and 1980. The new claimants on the fishing dollar-lenders, fishermen, plant workers and suppliers - represented costs that soon grew to offset extraordinary increases in market prices, leaving the industry floating once more in a sea of red ink." (Kirby, 1982)

The Task Force recommended against the establishment of a new general program of financial assistance for either fishermen or processors. It felt that the most pressing

problem was the near collapse of several major processors with extensive operations in Newfoundland. The Task Force concluded that a large injection of new equity capital was required. Additional debt would not solve the problem. It noted that attracting equity capital from the Canadian private sector at that time would be difficult in light of the recent performance of the fishery. The Task Force observed:

> "The restructuring of the assets of these companies into a viable company (or companies) may only be able to be achieved with an infusion of government funds most likely by way of government equity. But this assistance should be a one-time effort only, after which the resulting entity should stand on its own, including the ability to finance new trawler purchases without special government assistance." (Kirby, 1982)

5.2.7. Restructuring the Atlantic Groundfish Fishery - 1983-84

When the Task Force Report was released in February 1983, its Chairman, Michael Kirby was already engaged, with a small core group, in negotiations aimed at restructuring of the Big Five vertically integrated groundfish companies.

Space precludes a detailed discussion of the restructuring negotiations. For the perspective of the chief federal negotiator, see Kirby (1984). Another perspective is provided by Parsons (In Press).

After protracted negotiations with the Province of Newfoundland focused on the question of whether certain fish plants should be closed, on September 26, 1983, Minister De Bané and Premier Peckford announced that an agreement had been reached (Canada-Newfoundland, 1983). This agreement provided that a new company be formed from the assets of Fishery Products, the Lake Group, John Penney and Sons and North Atlantic Fisheries Ltd. (owned by the province and H. B. Nickerson and Sons Ltd.). The company would be financed by a

cash contribution of $75.3 million from the federal government to purchase equity in the company, the conversion of $31.5 million of debt to equity by Newfoundland and the conversion of $44.1 million debt to equity by the Bank of Nova Scotia. The company would be owned 60 percent by Canada, 25 percent by Newfoundland, 12 percent by the Bank of Nova Scotia and 3 percent by employees (tentative). This new company, Fishery Products International (FPI) was later to become one of the world's largest fishing companies.

Negotiations with Nova Scotia took longer. In the summer of 1983 National Sea Products informed the federal and provincial governments that it was in financial difficulty and that additional investments in the order of $25-$50 million would be required to keep the company afloat. On September 30, 1983, in Port Hawkesbury, Premier Buchanan and Minister De Bané announced that the federal and Nova Scotia governments had agreed to cooperate in helping to restructure National Sea Products and certain assets of H. B. Nickerson and Sons "with the aim of creating a commercially viable, privately owned offshore fishery." (Canada-Nova Scotia, 1983).

The two governments stated that "an equity interest in NSP in return for new federal government cash, and conversion of some bank and government debt to equity, is the only alternative for solving" the deteriorating financial condition of National Sea Products.

Independent fish processors in Nova Scotia reacted negatively to the announced restructuring of National Sea Products. As a result, the deal with Nova Scotia began to fall apart. Late in 1983 some minority shareholders led by David Hennigar made an alternative proposal to the Board of National Sea Products - a so-called "private sector solution." Initially this was rejected by the Bank of Nova Scotia and the Royal Bank, the major creditors of National Sea Products. But pressure mounted from within the province in favour of a private sector solution.

On February 6, 1984, Minister De Bané announced that the Directors of National Sea Products had approved a comprehensive plan for restructuring the company (DFO, 1984b). The Hennigar group had increased its direct equity contribution to National Sea Products from zero to $20 million. The Toronto-Dominion Bank purchased $75 million of financial difficulty term-preferred shares. The federal government contributed $10 million in equity to purchase preferred shares. The Nickerson assets in Nova Scotia (less the 12 scallop vessels and associated facilities at Riverport which went to the Newfoundland company) were passed to National Sea Products. The Government of Nova Scotia converted $18 million of Nickerson debt to equity in National Sea Products and added $7 million for a total $25 million of National Sea Products preferred shares. Overall, National Sea Products received an equity injection of $55 million. The private sector retained control of the company with private shareholders holding 66 percent of National Sea Products common shares, the federal government 20 percent and the Bank of Nova Scotia 14 percent. This agreement with National Sea Products in February 1984 set the stage for the emergence of two large fishing companies from the ashes of the previous Big Five.

The federal government also intervened in Québec to purchase the assets of the insolvent Québec cooperative Pêcheurs Unis. Its assets were acquired by a new company, Pêcheries Cartier, which was federally dominated but also involved the main financial institutions, the Caisses Desjardins and the Banque Nationale du Canada. The federal government injected $23.6 million in equity and the two financial institutions agreed to convert $2.0 and $1.0 million respectively of their debt into equity in the new corporation.

The federal government through its investment in the new Fishery Products International and National Sea Products had intervened in a major way to prevent the collapse of the

Atlantic offshore groundfish fishery and to weather the latest crisis in the groundfish industry. The hope was that these restructured companies would be economically viable and strong enough to withstand any future downturns.

The extent of federal investment turned out to be much higher than originally envisaged. Some of it was upfront equity injection; some involved downstream purchase of BNS shares. Furthermore, the federal government injected additional capital into Fishery Products International in 1985 following the development of a five-year business plan by the new management.

Parliament appropriated a total of $246.37 million during the period November 30, 1983 to March 31, 1986, to cover the federal investment in these three restructured companies. No funds were appropriated for this purpose in 1987-88 and 1988-89 (see Annual Reports, Atlantic Fisheries Restructuring Act).

The federal government invested $167.6 million in FPI from 1984 to 1987. When Fishery Products International was privatized in 1987, the federal government received $104.4 million, which left a net expenditure on the Fishery Products International restructuring of $63.2 million.

5.2.7. The Glory Years - 1985-1988

The federal intervention put the industry on the road to recovery. The groundfish resource had recovered significantly since 1977 (Figure 6-13). When restructuring was completed in 1984, groundfish markets were soft, with cod blocks, for example, having been around $1.17 U.S. per pound through 1983, dipping to around $1.00 in the latter half of 1984 and first half of 1985 (Figure 6-14). However, in the second half of 1985 the market began an upswing which continued until mid 1988. The price of cod blocks doubled from $1.03 in June 1985 to $2.00 during August 1987 to March 1988. The per capita consumption of fish in the U.S. increased significantly in the mid-1980s, peaking at 15.4 pounds in 1987. In the latter half

of 1988, high inventories, slow seafood sales, and lower prices for alternative sources of protein combined to produce a downturn in seafood prices.

The upswing in the U.S. market in the mid-1980s fuelled a recovery in the Atlantic groundfish industry. But the restructured companies, which constituted the major component of the industry, did not show a profit again until 1985 in the case of National Sea Products and 1986 in the case of Fishery Products International.

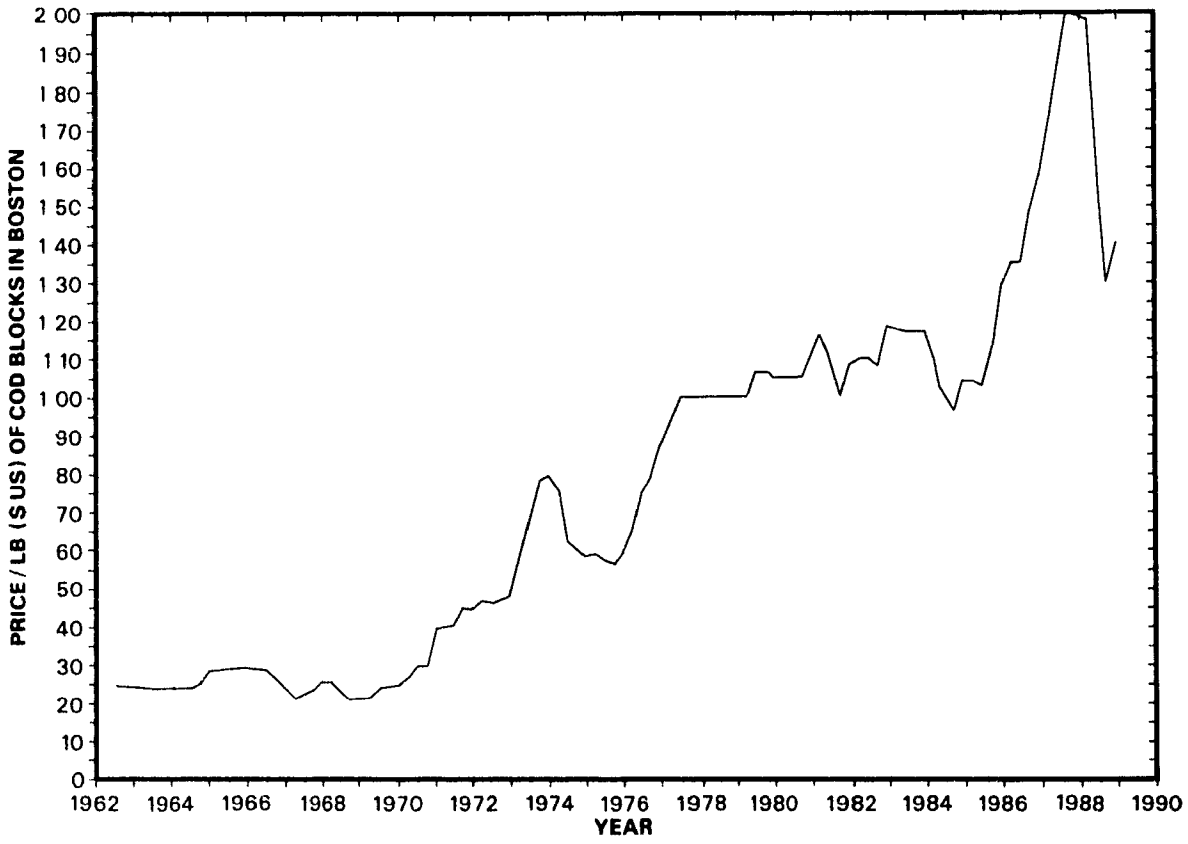
In 1985, National Sea Products reported a net operating income of $7.2 million. In 1986 and 1987, this increased to $21.8 million and $27.6 million respectively. NSP then launched on a program of diversification and acquisition abroad (see Annual Reports, National Sea Products).

Fishery Products International took slightly longer to get on its feet. It reported a net operating loss of $35.0 million in 1984 and $20 million in 1985. In April 1987, the shares held in Fishery Products International by the federal and provincial governments were returned to the private sector. Following privatization, the company was owned 88.5 percent by private shareholders, 8 percent by the Bank of Nova Scotia, and 3.5 percent by the FPI employees. FPI reported a net operating income of $22.3 million in 1986 and $31.0 million in 1987 (see Annual Reports, Fishery Products International).

The years 1985 to mid-1988 were boom ones for the Atlantic groundfish industry. This period was probably the most prosperous in history for the Atlantic fishery. Prices and earnings reached record highs and catches were maintained at high levels.

Fig. 6.14 Trends in cod block prices in the U.S. market, 1962-1988.

Source: DFO Statistics, Marketing unit, Ottawa


PRICE / LB (S US) OF COD BLOCKS IN BOSTON
2 00
1 90
1 80
1 70
1 60
1 50
1 40
1 30
1 20
1 10
1 00
90
80
70
60
50
40
30
20
10
0
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
YEAR

5.2.8. Crisis Again? 1989 - 1990

5.2.8.1. Another Crisis in the Making

While prices and earnings were high during 1986 to 1988, difficulties emerged from the resource perspective. The catch rate of Canadian trawlers peaked in 1984 (Figure 5-3) at 19 tons per day fished and declined thereafter to 16 tons per day fished in 1986. The increase in groundfish catches from a low in 1974 to peaks in 1982 and 1986 had been supported by a large increase in cod catches from 146,000 tons in 1975 to the 500,000 ton range from 1982 to 1988 (Figure 6-11). Cod catches as a percentage of the groundfish catch increased from 35 percent in 1975 to 66 percent in 1983 and remained at more than 60 percent from 1982 to 1988. The biomass of cod off the Canadian Atlantic coast increased three-fold from 1975 to 1984 but then declined slightly to 2.6 times the 1975 level in 1988 (Figure 6-15).

Recent assessments indicate that fishing pressure remained high for haddock stocks and certain cod stocks in the 1980s and that the management target of fishing at $F_{0.1}$ was not attained for many stocks (Pinhorn and Halliday, 1990). Overall, the resource picture which had been bright in the early 1980s appeared less so by 1989. Scientists revised their estimates of the size of the northern cod stock and advised a substantially lower TAC for 1989. The TACs for other cod stocks had declined significantly from the mid-1980s to 1989. Haddock TACs had been sharply reduced from 1986 onward (Figures 6-16 and 6-17).

Thus, by 1989, it appeared that the industry could expect lower, not higher, catches for the next several years. The reasons for this levelling off in some stocks and decline in others were not clear. However, it appeared that the stocks had been less productive in the 1980s. This was manifested in fewer young fish on average and slower growth rates, i.e. a decline in average weight at age (Figure 6-18).

Fig. 6.15 Trends in cod biomass in the Northwest Atlantic, 1962-1988.

Source: DFO Fisheries Research Branch, Ottawa

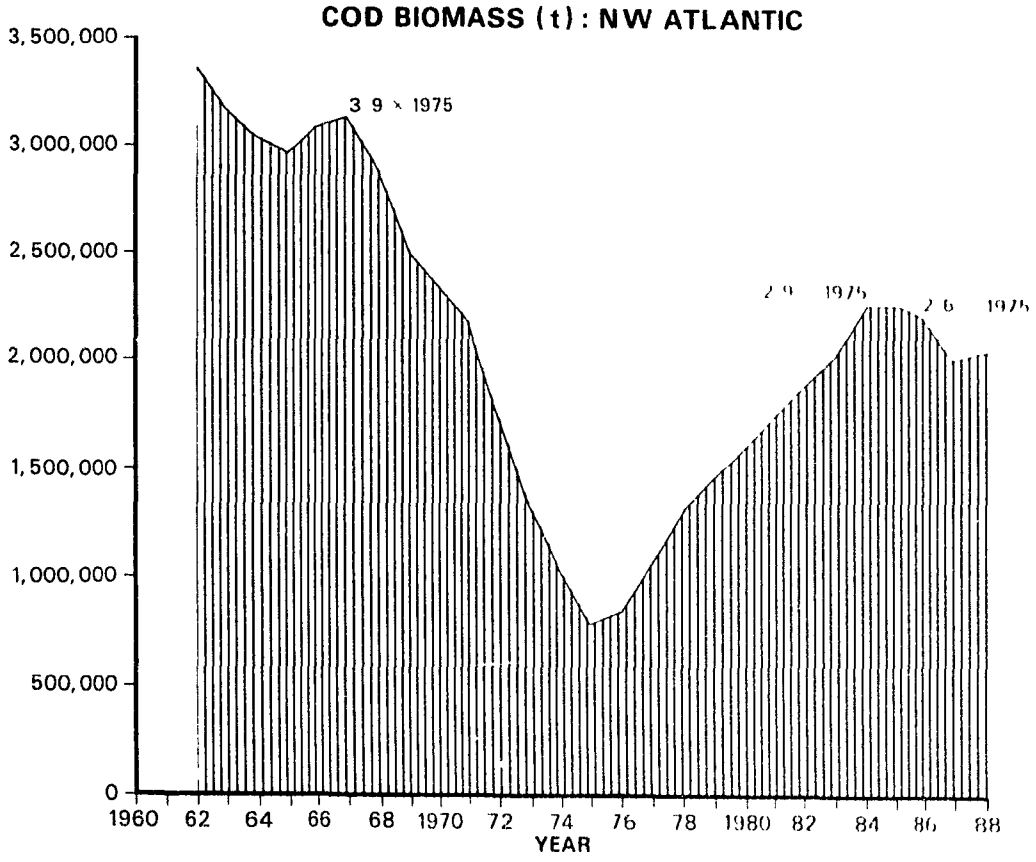

COD BIOMASS (t) : NW ATLANTIC
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
3 9 × 1975
1960
62
64
66
68
1970
72
74
76
78
1980
82
84
86
88
YEAR

Fig. 6.16 Historical TACS for cod, 1976-1990.

Source: DFO Fisheries Research Branch, Ottawa

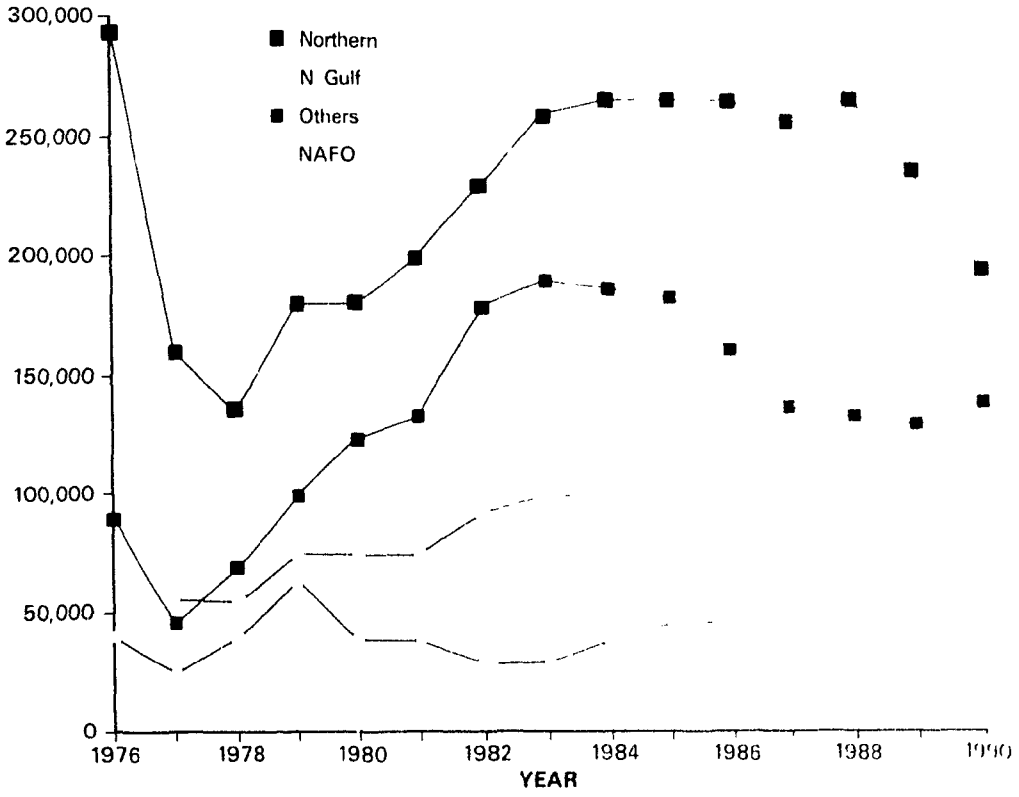

300,000
250,000
200,000
150,000
100,000
50,000
0
Northern
N Gulf
Others
NAFO
1976
1978
1980
1982
1984
1986
1988
YEAR

Fig. 6.17 Historical TACs for haddock on the Scotian Shelf, 1976-1990.

Source: DFO Fisheries Research Branch, Ottawa

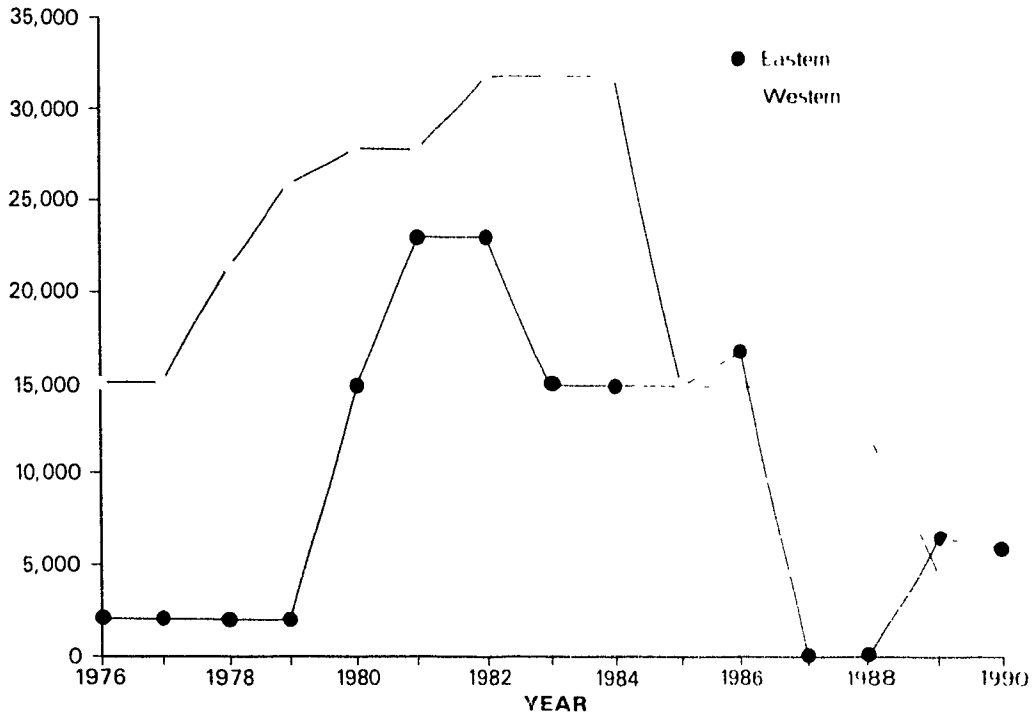
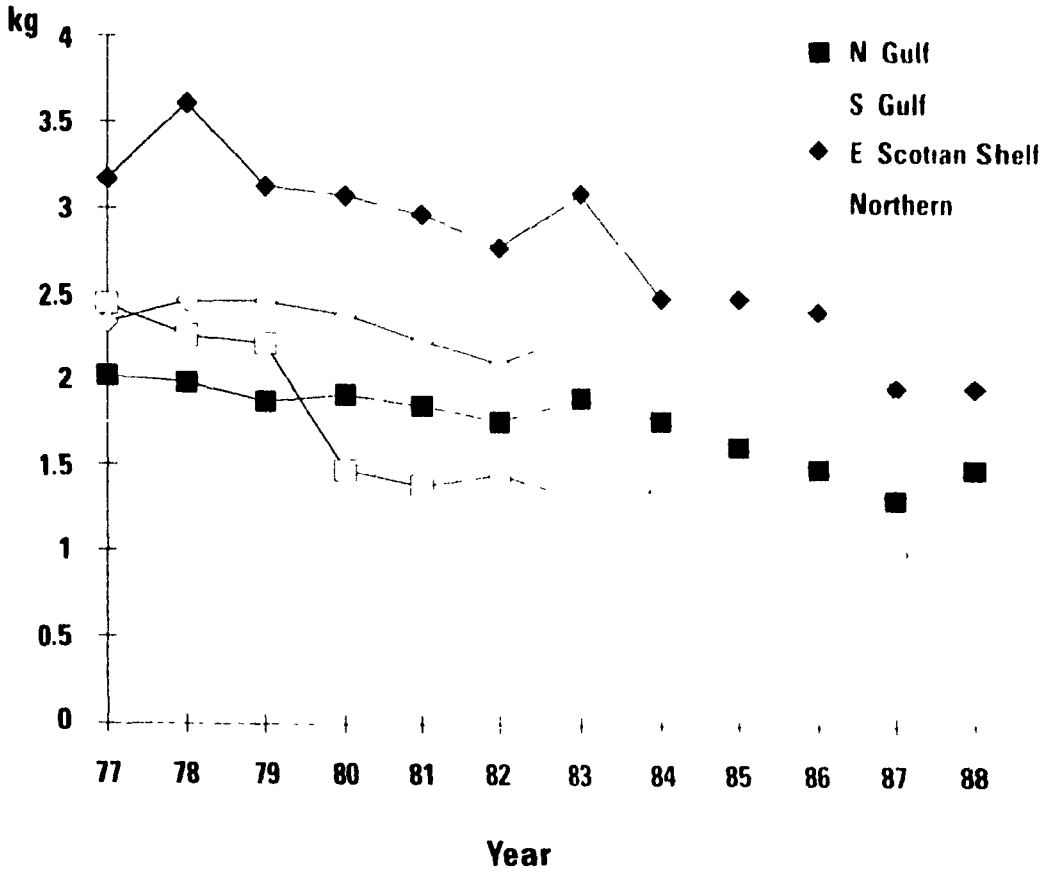

35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1976
1978
1980
1982
1984
1986
1988
1990
YEAR
Eastern
Western

Fig. 6-18 Weight of an age 7 cod.

Source: DFO Fisheries Research Branch, Ottawa

WEIGHT OF AN AGE 7 COD



For a while, rising prices masked stock declines, e.g. Scotia-Fundy groundfish (Figure 6-19). Also the industry and governments had not learned from the 1981-83 crisis. Despite the recommendations of the Task Force on Atlantic Fisheries on the need to reduce capacity in the industry, significant growth in harvesting and processing capacity continued through the 1980s. On an Atlantic-wide basis, the number of registered fishermen increased only marginally between 1983 and 1988 (from 57,000 to 66,000). While the number of registered fishing vessels in Atlantic Canada remained about the same, there was a significant growth in catching capacity through technological change. The vessels, in many instances, became larger and more efficient. Perhaps the most dramatic example of this occurred in Scotia-Fundy.

The 1989 Report of the Scotia-Fundy Groundfish Task Force (DFO, 1989c) noted that the fishing power of vessels in the Scotia-Fundy groundfish fishery had increased dramatically since 1980. The newer vessels, especially the wide, deep "jumbo" draggers, had larger hold capacity, bigger engines, more sophisticated fish-finding equipment and more efficient types of gear. During the 1980s the smaller, less powerful vessels were usually replaced with larger ones (Figure 6-20). The average annual catch off the newer "jumbo" vessel was 200 tons compared with 23 tons for the conventional dragger.

Background studies done for the Task Force indicated that fishing mortality for the primary species of interest in Scotia-Fundy--cod, haddock, and pollock-was more than double $F_{0.1}$ during the 1980s. Fishing capacity was probably four times the level required to harvest the available resource economically. As a result, haddock, pollock and cod stocks on the Scotian Shelf all declined during the late 1980s, with the haddock decline commencing in the early 1980s.

Despite the warnings about existing overcapacity in the processing sector, the number of federally registered fish

Fig. 6.19 Rising prices mask declines in Scotia-Fundy groundfish stocks.

Source: DFO Statistics and Fisheries Research Branch, Ottawa

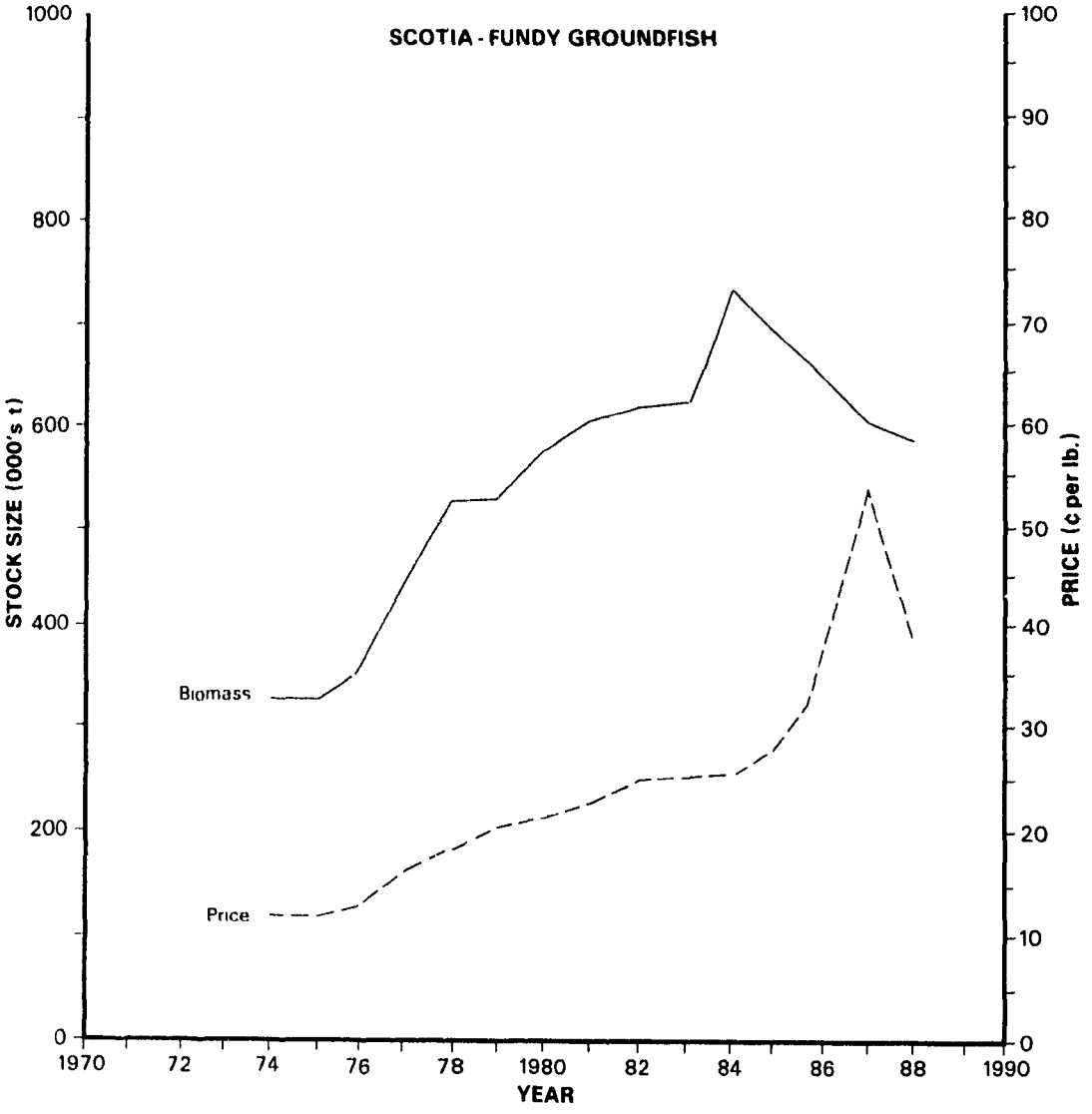
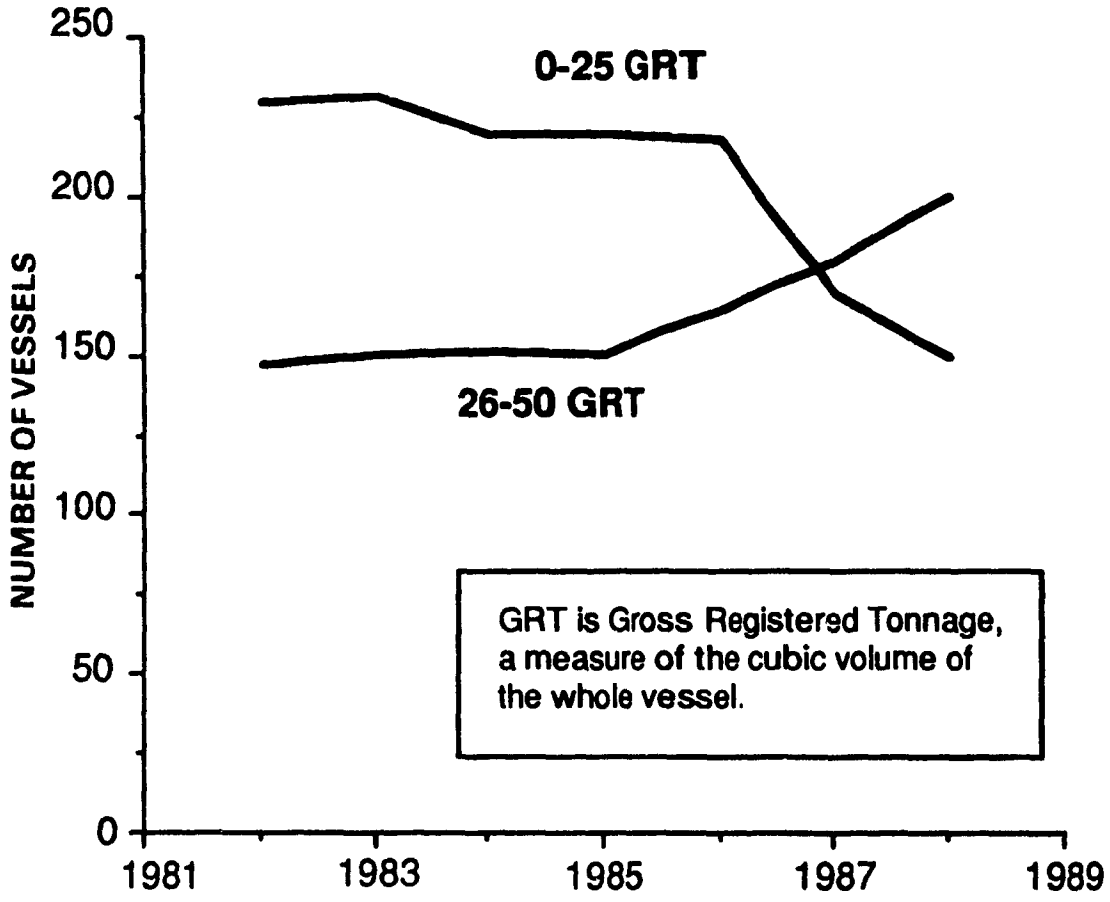

SCOTIA - FUNDY GROUNDFISH
STOCK SIZE (000's t)
PRICE (¢ per lb.)
YEAR
Biomass
Price
1000
800
600
400
200
0
100
90
80
70
60
50
40
30
20
10
0
1970
72
74
76
78
1980
82
84
86
88
1990

Fig. 6-20 Trends in the number of low capacity (<25 gross tons) and high capacity (26-50 gross tons) vessels in the Scotia-Fundy Region's Mobile Gear Fleet under 45 feet in length.

Source: Report of the Scotia-Fundy Groundfish Task Force, DFO, 1989


250
200
150
100
50
0
NUMBER OF VESSELS
0-25 GRT
26-50 GRT
GRT is Gross Registered Tonnage, a measure of the cubic volume of the whole vessel.
1981
1983
1985
1987
1989

plants in Atlantic Canada, which had increased from 519 in 1977 to 700 in 1981, increased further to 953 in 1988. This amounted to a 35 percent increase between 1977 and 1981 and a 36 percent increase between 1981 and 1988. Most of the growth in the latter period occurred between 1984 and 1988, when the number of fish processing establishments increased from 727 to 953. The greatest rate of growth in the post-1981 period occurred in Nova Scotia and New Brunswick (Figure 6-21).

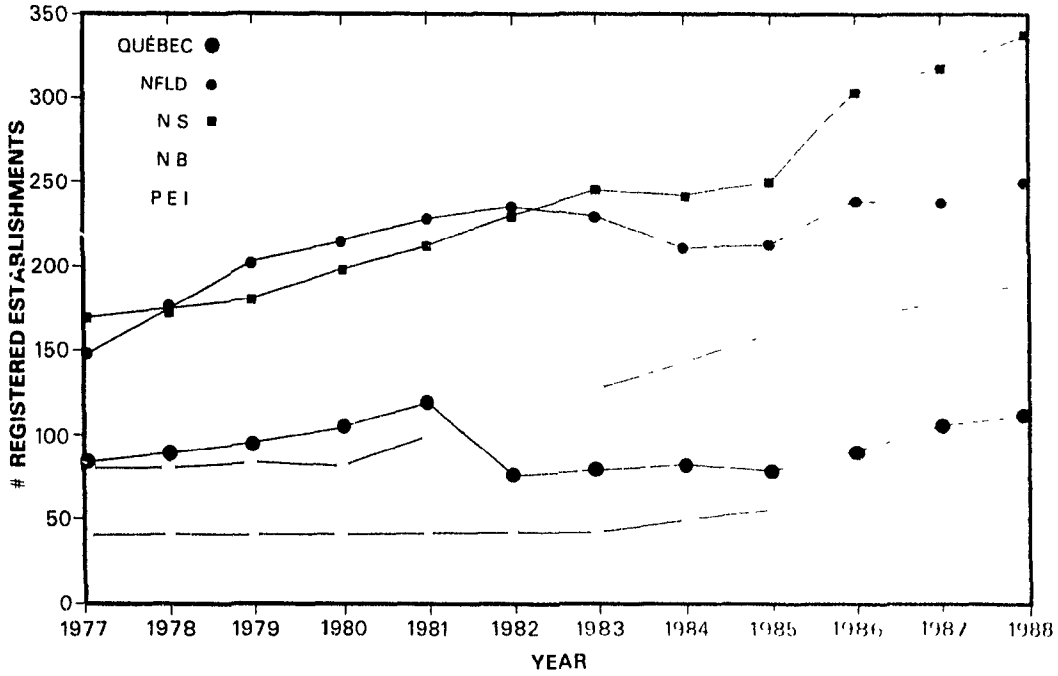
Given this expansion of harvesting and processing capacity in conjunction with the resource declines being experienced in the late 1980s, the boom of 1985 to 1988 could not last. The market downturn in mid-1988 combined with decreased TACs for certain key stocks, e.g. northern cod in 1989, set the scene for another downturn in the groundfish industry, approximately 5-6 years after the trough of the last crisis.

The two major companies dependent on groundfish, NSP and FPI, again faced stormy seas. NSP went from a net income of $24.8 million in 1987 to a loss of $5.8 million in 1988. FPI's net income went from $58.0 million in 1987 to $16.8 million in 1988. For 1989 both companies reported losses - NSP of $32.4 million and FPI of $22.2 million. The decline in revenues was attributed to cuts in quotas and a downturn in fish prices. Furthermore, NSP's and FPI's revenues were cut further by a strong Canadian dollar, which reduced the profit margin on exports to the U.S.

By early 1989 it was clear that the industry was facing another groundfish crisis. The federal government appointed a Task Force on Northern Cod, headed by former Associate Deputy Minister of Fisheries, Ken Stein, reporting to a special Cabinet Committee, as well as the Harris Panel on Northern Cod. Fisheries Minister Siddon had also appointed a Scotia-Fundy Groundfish Task Force headed by Regional Director-General Jean Haché. These groups attempted to come

Fig. 6-21 Trends in number of Registered Fish Processing Establishments in Atlantic Canada, 1977-1988. (Note: Numbers of Plants in New Brunswick in 1982 is not available).

Source: DFO Inspection Branch, Ottawa


QUÉBEC
NFLD
N S
N B
P E I
REGISTERED ESTABLISHMENTS
YEAR
0
50
100
150
200
250
300
350
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988

to grips with the extent and potential impact of the resource decline and overcapacity problems.

5.2.8.2 Industry Response To The 1989-1990 Crisis

The two major vertically integrated companies involved in the offshore Atlantic groundfish fishery, NSP and FPI, both experienced major losses in 1989. The offshore and inshore landings processed by NSP had declined each year from 1985 to 1989 with a cumulative drop of 31 percent (43,100 tons). This reduced catch resulted in significant plant overcapacity with the reduction in catch representing the annual processing capabilities of two large plants. During 1988, NSP experimented with rotating plant shutdowns which in total, including a strike in early 1989, resulted in 28 months of plant shutdowns (the equivalent of 2.3 of NSP's nine plants being closed year-round). (See Annual Reports for 1988 and 1989 National Sea Products).

The company determined that these temporary closures did not significantly reduce its operating costs and it decided to permanently close its Lockeport plant on October 1, 1989. Also, in response to the quota reductions, NSP announced, on December 11, 1989, the indefinite closure of two more plants, Canso, Nova Scotia, and St. John's, Newfoundland, and the reduction of wetfish operations at its North Sydney plant. It was estimated that these closures would mean the loss of employment for 1500 people.

Subsequently, NSP reached an agreement with the provincial and federal governments in 1990 to operate Canso at reduced volume and to examine the feasibility of converting the St. John's plant to shrimp processing. NSP also decommissioned four of its offshore trawlers in 1989 and an additional four trawlers in 1990.

FPI also experienced a major loss in 1989. Its groundfish landings decreased by 15 percent between 1988 and 1989. At the end of 1989 it estimated that its 1990 quotas

would be 26 percent less than 1988 levels. The capacity utilization rate in FPI's primary processing plants dropped from 65 percent in 1988 to 55 percent in 1989 and was projected to approximate 45 percent in 1990.

Early in 1990, FPI moved to deal with this overcapacity problem by rationalizing its operations. On January 5, 1990, it responded to the 1990 Groundfish Management Plan by announcing plans to reduce both harvesting and processing capacity. The proposed measures included:

1. The permanent retirement of 13 trawlers;
2. The processing plants at Gaultois, Grand Bank, and Trepassey would be permanently closed but not until the end of their operating period in 1991. (The plants would continue to operate in 1991 because the Newfoundland government had agreed to finance an extended notice period);
3. Consolidation of personnel throughout the company and a general downsizing (FPI, 1990).

Both NSP and FPI rebounded in 1990, partly as a result of consolidating and streamlining their operations. NSP sold its plants in Canso and Burgeo to a new company named Sea Freez on November 2, 1990. On sales of $608 million in 1990, NSP reported a loss of $2.2 million. It attributed the improvement to a number of factors, including the restructuring of operations in Canada and the U.S., a reduction in processing capacity and strong market prices (NSP, 1990).

FPI rebounded from a 1989 loss of $22.2 million on sales of $349.8 million to a net income of $11.8 million on sales of $535 million in 1990. These results were attributed to cost reductions, higher sales and new products from the acquisition of Clouston Foods Canada Ltd., an international seafood trading and marketing firm with subsidiaries in Massachusetts and Washington.

1991 was to bring further changes to FPI's operations. In addition to closing several sales offices, FPI closed its plant in Gaultois on May 24, 1991 and its Grand Bank plant on May 31, 1991. The Trepassey plant was closed at the end of September. These closings reduced the number of FPI employees by approximately 1300, leaving the company with approximately 6,400 employees and 15 plants operating at about 65 percent of their combined capacity in Newfoundland, Nova Scotia and Massachusetts. In mid-1991 efforts were underway to have other companies operate these closed plants.

Both FPI and NSP experienced further difficulties in 1991. During the first nine months of 1991, FPI recorded a net loss of $1.5 million compared with income from operations of $0.3 million for the same period in 1990. NSP had a net loss of $2 million for the first nine months of 1991 compared with a $3.2 million loss for the same period in 1990. However, it recorded a loss of $8.8 million in the third quarter compared with a loss of $3.7 million in the third quarter of 1990.

FPI attributed its poor performance in the first nine months of 1991 to the extremely poor summer inshore fishery, combined with an ice-related offshore shortfall earlier in the year. These factors resulted in a continuing shortage of cod product which negatively impacted sales and net income (FPI 1991). NSP attributed its large 1991 third quarter loss to the colder-than-normal water temperatures which resulted in smaller catches for both offshore and inshore fisheries. (The Evening Telegram, St. John's, November 7, 1991).

Whatever the reasons it was clear that the latest crisis, which commenced in late 1988-early 1989, was not yet over.

5.2.8.3. The Federal Government's Response to the 1989-1990 Crisis

In response to the social and economic dislocation caused by the quota reductions for northern cod and other species,

and overcapacity problems, federal Ministers Valcourt, Crosbie and MacKay announced an Atlantic Fisheries Adjustment Program on May 7, 1990. AFAP had three elements "aimed at ensuring a viable fishery in the long-term for Atlantic Canadians, while supporting individuals and communities in the fishery to adjust to the realities of declining fish stocks and plant closures." (Canada, 1990).

These three elements were:

- Rebuilding the Fish Stocks
- Adjusting to Current Realities
- Economic Diversification.

This announcement of an expenditure of $426 million was additional to $130-million previously announced as a short-term response and $28-million for aerial surveillance, for a total federal contribution of $584 million over the next five years.

Under the Rebuilding the Fish Stocks element about $150 million was targeted towards expanded research on northern cod, other cod stocks off southwest Newfoundland and in the Gulf of St. Lawrence, Scotia-Fundy groundfish and Gulf snow crab.

An Industrial Adjustment Service program, (IAS), funded at $130 million, was intended to benefit laid-off workers (or workers identified for lay-off) in seven communities facing plant closures resulting from the northern cod reductions. The seven communities were: St. John's, Gaultois, Grand Bank, Trepassey, Canso, North Sydney and Lockeport. In addition, the IAS was to be used to help four other groups of individuals adjust to quota reductions: FPI trawlermen, inshore fishermen, the Scandinavian longliner fleet and the Burin refit centre.

The Economic Diversification Element, funded at $146 million, was to undertake measures for community economic diversification with a focus on fishery dependent communities affected by quota reduction. The aim was to provide

alternative employment opportunities and to encourage the exploration of underutilized species and stocks by assisting with marketing and fisheries development and assisting aquaculture development.

On December 14, 1990, Minister Valcourt announced a new Multi-year Groundfish Plan (DFO, 1990b). The TAC for northern cod was set at 190,000 tons in 1991, 185,000 tons in 1992 and 180,000 tons in 1992. This period of relative stability in TACs was proposed in the expectation that the stock would rebuild. This rebuilding would, however, occur very slowly. Hopes for stock rebuilding were based upon an apparently stronger-than-average 1986 year-class.

This Multi-year Groundfish Plan set three-year TACs for most stocks, generally at the same level as in 1990. The exceptions included northern cod, northern Gulf of St. Lawrence cod and southern Gulf of St. Lawrence cod.

Although Canada's Atlantic groundfish quotas were reduced by 16 percent between 1988 and 1990, it was estimated that by the end of 1990, total groundfish exports would only have decreased by eight percent (DFO, 1990b). Canadian fishermen were using more of their total groundfish quota, thus reducing the impact of quota reductions on supplies in the market place.

Demonstrating the volatility of markets as well as the resource base, prices for most groundfish products rose dramatically during 1990. For example, the price of cod blocks in the U.S. market increased 50 percent during 1990. Although it appeared that Canada's competitive position in the U.S. market was secure vis-a-vis major competitors such as Iceland and Norway, there was significant new competition from a variety of nontraditional groundfish, species such as Alaska pollock and cod, farm-raised catfish, South American hake and from new fish exporters.

The Atlantic groundfish industry began to emerge from the 1989-1990 downturn. This downturn was largely a result of

adjustments in resource supply, combined with exchange rate pressures. Again the federal government had stepped in with major financial assistance. Initiatives undertaken during the previous crises of the mid-1970s and the early 1980s had not resolved the underlying dilemma of fisheries management. It was not yet clear whether initiatives under AFAP would have a lasting impact through capacity reduction or provision of alternative employment opportunities through economic diversification.

Just as it appeared that the Atlantic groundfish industry had survived its third major downturn in less than two decades, the crisis deepened again early in 1992. Fisheries Minister John Crosbie, in response to preliminary CAFSAC advice for 1992 on northern cod (CAFSAC, 1992) slashed the Canadian northern cod TAC to 120,000 tons. This resulted in widespread temporary closures of fish plants in Atlantic Canada while the industry assessed the impact of the latest quota reductions. The continuing saga of the Atlantic groundfish fishery seems to be one of riding the roller coaster from boom to bust again and again.

6. THE SOCIAL DIMENSION

6.1. Dependence of Coastal Communities on the Marine Fisheries

Tens of thousands of Canadian fishermen in more than a thousand rural communities are dependent upon the fishery as their primary means of employment. They earn from the fishery chronically low incomes, buttressed by a special program of unemployment insurance for fishermen. For many, the total of their income is below the poverty line even for rural areas. Yet they cling to the fishery as their source of livelihood for a variety of reasons. Prominent among these is the lack of alternative employment opportunities within these or adjacent communities, and in some cases, even within their province. But other factors, such as work satisfaction and attachment to the rural lifestyle, play a part.

6.1.1. Atlantic

As we saw in Chapter II, there are significant differences among the various regions of Canada in the role that the fishery plays in the regional economy. While the fishing industry is extremely important in the Atlantic provinces, it plays a much less significant role in the British Columbia regional economy. In Newfoundland, the fishing industry's contribution to the Gross Provincial Product is the highest in Canada, around 15 percent. Next highest are the fishing industries in P.E.I. and Nova Scotia which contribute about 13 percent and 11 percent to their respective GPPs. In British Columbia the fishery contributes less than one percent to the GPP.

In 1988, the Atlantic fishing industry provided jobs for approximately 65,000 registered fishermen and 40,000 plant workers. The dependence on jobs in the fishing industry ranges from a high of 25 percent on the south coast of Newfoundland to around two percent in large cities such as Halifax. The fishing industry provides over ten percent of all jobs in Atlantic Canada.

The Task Force on Atlantic Fisheries (Kirby, 1982) concluded that more than one-quarter of the total population of 2.1 million in the four Atlantic provinces (Newfoundland, Nova Scotia, PEI and New Brunswick) lived in 1,339 small fishing communities. They identified small fishing communities as:

1. Any community with a population of fewer than 2,500 people and having at least 5 fishermen using it as their home port or usual port of landing; and
2. Any community with a population between 2,500 and 10,000 people, if the total of fishermen plus plant jobs exceeded 1 percent of the population. (A total of 28 towns met their second criterion).

The provincial distribution and population ranges of these small fishing communities are shown in Table 6-7.

Newfoundland had the largest percentage of its provincial population living in small communities, while New Brunswick had the smallest (Figure 6-22). More than half of these small communities had essentially single sector economies, with fishing and fish processing employing 30 percent or more of the labour force.

Some 42,000 of the 46,800 jobs identified in fish processing plants in 1980 were located in small fishing communities. These jobs comprised 22.2 percent of the labour force in these communities. This was considered to be an underestimate of total plant employment because a large number of very small operations located in the small communities were not included.

Of the 23,000 full-time licence holders who fished in 1981, the TFAF estimated that at least 18,000 lived in the small fishing communities. It concluded that the fishing industry was the source of at least 62,250 direct jobs in these small fishing communities in Newfoundland and the Maritimes, representing at least 35.3 percent of the overall employment in these communities.

Poetschke (1984) observed that 90 percent of the small Atlantic fishing communities had a population of less than 1,000 and 75 percent had fewer than 500 inhabitants. Only 137 communities had a population of over 1,000.

Poetschke estimated that one-third of the 600,000 people living in Atlantic fishing communities (including Québec) lived in single-sector fishing communities. At least 40 percent of all Atlantic fishing communities were single-sector. Almost 80 percent of the known single-sector communities were in Newfoundland (55%) and Nova Scotia (24%). One-quarter of the Atlantic fishing communities were extremely dependent on fishing with about 60 percent of the labour force working directly in fishing and fish processing.

Table 6 7 Size and location of small fishing communities

Population	Nfld	N S	N B	P E I	Qué	TOTAL
5000-9999	3	3	0	1	1	8
2500-4999	13	3	4	0	4	24
1000-2499	43	20	19	6	16	104
500-999	98	34	23	3	24	182
200-499	193	102	29	17	37	378
100-199	123	97	28	18	11	277
Fewer than 100	74	71	22	17	9	193
Unknown*	81	34	31	3	24	17
TOTALS	628	364	156	65	126	1339

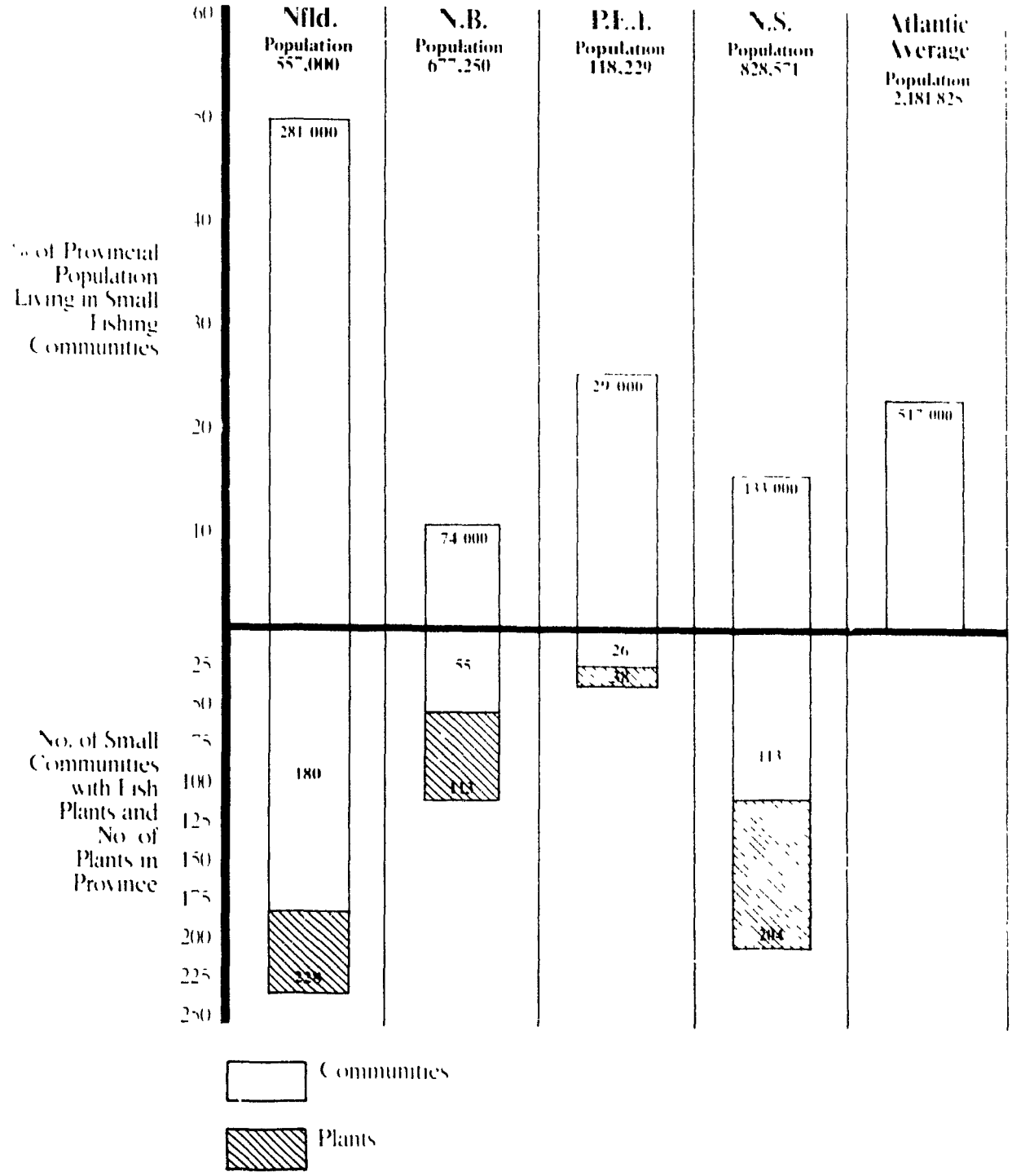
* Population figures were not available for the communities labelled "unknown", probably because they were too small to be included in the census as discrete communities

Source Kirby, M J L 1982 - Navigating Troubled Waters

Fig. 6-22 Small fishing communities - population and fish plants.

Source: Kirby, M.J.L. 1982. Navigating Troubled Waters

Small Fishing Communities— Populations and Fish Plants



Overall, three-quarters of the very small fishing communities (populations less than 100) were single-sector. One-half of those in the 100-500 population range were single-sector, 39 percent of those in 500-999 population range and about 30 percent of those in 1000-5000 population range.

These data from the TFAF and Poetschke's analyses illustrate the overall importance of fishing to the Atlantic region. Of the 600,000 people who lived in fishing communities, about 200,000 people lived in communities where fishing activity was the principal, if not the only, employer. When jobs created by the multiplier effect of the fishing sector are added to direct fishing employment, the dependence on the Atlantic fishery is considerably greater than is indicated by direct employment figures alone (Poetschke, 1984).

6.1.2. Pacific

The situation in British Columbia, with respect to regional and community dependence on fishing, is quite different from that in the Atlantic. There are no recent studies of relative community dependence on the fishery in British Columbia. Sinclair (1971) provided an assessment of the economic and social significance of the west coast commercial fishing industry to selected isolated coastal communities of British Columbia. Marchak *et al* (1987) in their study of the fishing and fish-processing industries in British Columbia entitled "Uncommon Property" also provided some observations on the relative importance of fishing within British Columbia. The comments that follow are drawn largely from these two sources.

In British Columbia, the fisheries have considerably less importance in the overall economy compared with the Atlantic provinces. The major industries are forestry and mining. Even agriculture ranks ahead of fisheries. In 1980, for example, the landed value of the fishery was $153 million and

the market value $264 million compared with $6.996 billion for forestry and $2,949 billion for mineral production. 1980 was a poor year for the fishery but the relative comparison is the same since World War II. In the boom year of 1976, for example, the market value for the fishery was $250 million compared with $400 million for agriculture, $1.486 billion for mineral production and $4.0 billion for forest products.

These figures do not take account of the importance of the recreational fishery and its contribution to tourism. Expenditures attributable to sportfishing in British Columbia in 1985 were $144 million, the third largest in the country behind Ontario and Québec (Survey of Sportfishing in Canada, DFO, 1985b).

The coastline of British Columbia is now relatively unpopulated. Many of the communities and people dependent on fishing are gone. Outside of the southern lower Mainland area, the majority of the population along the coast is located in a few lumber or mineral-dependent towns, Nanaimo, Courtenay, Campbell River, Kitimat, Port Alberni, Powell River or in the northern transportation centre of Prince Rupert. Only a small proportion of the coastal residents rely on fishing; an even smaller proportion rely on fish processing. In the mid-1980s there were only five canneries outside of the Fraser (lower mainland) district where once there were more than sixty. Three of these were located in Prince Rupert with only two located along the 4,500 miles of coast between the Fraser and Skeena rivers. Whereas 86 percent of all fish processing workers were located outside the Fraser district in the mid 1920s, by the mid-1950s the percentage had declined to 42 percent because of plant closures. Today, most of the remaining settlements along the coastline are native village (Marchak *et al*, 1987).

For a discussion of the factors leading to the decline of these coastal cannery communities, see Marchak *et al* (1987). Outside Vancouver and Prince Rupert, the fish processing

sector is now almost non-existent. A significant proportion of fishermen, however, still continue to reside in rural communities.

6.1.3. Arctic

The Arctic is quite different from the Atlantic and Pacific coasts in the role the fishery plays in the regional economy. The Arctic coastal area is still occupied primarily by aboriginal peoples. About 40,000 people, 78 percent aboriginal, occupy 60 communities along the Arctic coast and in the MacKenzie Delta (Clarke, In Press).

Harvesting of fish and marine mammals has always been an important subsistence activity in the Arctic. Subsistence fisheries occur in all areas where people live or travel. The fisheries contribute one of the few sources of employment and cash in Arctic communities.

Overall, the most significant impact of the fisheries to the Arctic communities lies in the cultural and social benefits provided. Clarke concluded:

> "Although the Arctic fisheries are small compared to the Atlantic and Pacific fisheries, they play an integral and major role in the lives of northern Canadians. Harvesting fish and marine mammals is part of the traditional culture of the native peoples and provides a considerable portion of their food. The commercial and recreational fisheries provide one of the few sources of cash and employment in northern communities. The fisheries provide employment or occupation for 50-75% of the population, have an estimated value of about $15 million as the replacement value of food from the subsistence harvest, $1 million as other consumer surplus benefits and $6.3 million as the value added to the Canadian economy."

6.1.4. General

Overall, the extent of regional and community dependence on the fishery differs considerably among the Atlantic, Pacific and Arctic coasts of Canada. On the Pacific coast, fishing is a relatively minor component of the economy. The number of coastal communities dependent on fishing has declined dramatically over the past half-century. Today there remain some rural communities and Indian villages where fishing is an important contribution to the way of life and as a means of livelihood for many individuals. In general, however, the fishery is based in large towns and metropolitan areas, particularly with respect to the processing sector but also, to a lesser extent, for the harvesting sector.

On the Atlantic coast, the situation is quite different. The fishery was the basis for the establishment of hundreds of small coastal communities and remains the chief, and, in many cases the only, source of livelihood for the majority of such communities. The degree of dependence of these communities upon the fishery is considerable. Too often planners have glibly envisaged an industrialized fishery based in large growth centres. The botched attempts at resettlement in Newfoundland are but one testimony to the failure of such policies to recognize the harsh realities of the rugged Atlantic coastline. The people who live in these communities are attached to fishing as a way of life and depend upon it for a living. They have little in the way of alternative employment opportunities. The bright lights of distant cities have enticed some with dreams of prosperity. But in many instances these dreams have been shattered.

These coastal communities have played a vital role in the Atlantic economy and social structure. But the nature of life in these communities, where people eke a meagre existence from the tempestuous sea, is often harsh. Residents of these communities who earn their living from the sea in many instances live on the edge of poverty, with chronically low

incomes, and little opportunity to improve their economic situation.

6.2. Fishermen's Incomes

The Task Force on Atlantic Fisheries in 1982 undertook a detailed survey of the incomes of Atlantic-coast fishermen in 1981, using the DFO categorization of full-time and part-time fishermen. Of the 48,434 individuals to whom licences were issued in the four Atlantic provinces in 1981, approximately 23,400 earned their living as full-time fishermen. In addition, about one-quarter of part-time fishermen had fishing revenue comparable to full-timers. From this, the Task Force estimated that a total of nearly 28,000 active fishermen derived their primary source of earnings from fishing activity.

On average, the net fishing incomes earned by full-timers were more than four times greater than the net incomes of part-timers (Table 6-8). The median income for full-timers was $6,500 and for part-timers $840. Average incomes were distorted by the fact that the top 10 percent of full-timers earned $23,350 or more and the top 10 percent of part-timers $6,000 or more.

Considerable variability in average and median incomes among areas was observed (Figure 6-23). Full-time fishermen earned the highest net fishing incomes in western Nova Scotia ($28,766) and the lowest in northeast Newfoundland and Labrador ($4,512).

Fishermen benefited significantly from income transfers such as unemployment insurance, family allowance and pension benefits. These amounted to an average of $2,910 for full-time fishermen and $2,206 for part-time fishermen. Unemployment insurance contributed the bulk of this ($2,466 for full-timers and $1,483 for part-timers).

Table 6.8 Revenues, costs, average and net fishing incomes for full-time and part-time fishermen

Revenues, Costs and Average Fishing Incomes

	Full-time	Part-time
Gross Revenues	$22,452	$3,703
Total Costs	10,545	920
Net Income (before tax)	$11,907	$2,783

Net Fishing Income for Full-time and Part-time Fishermen

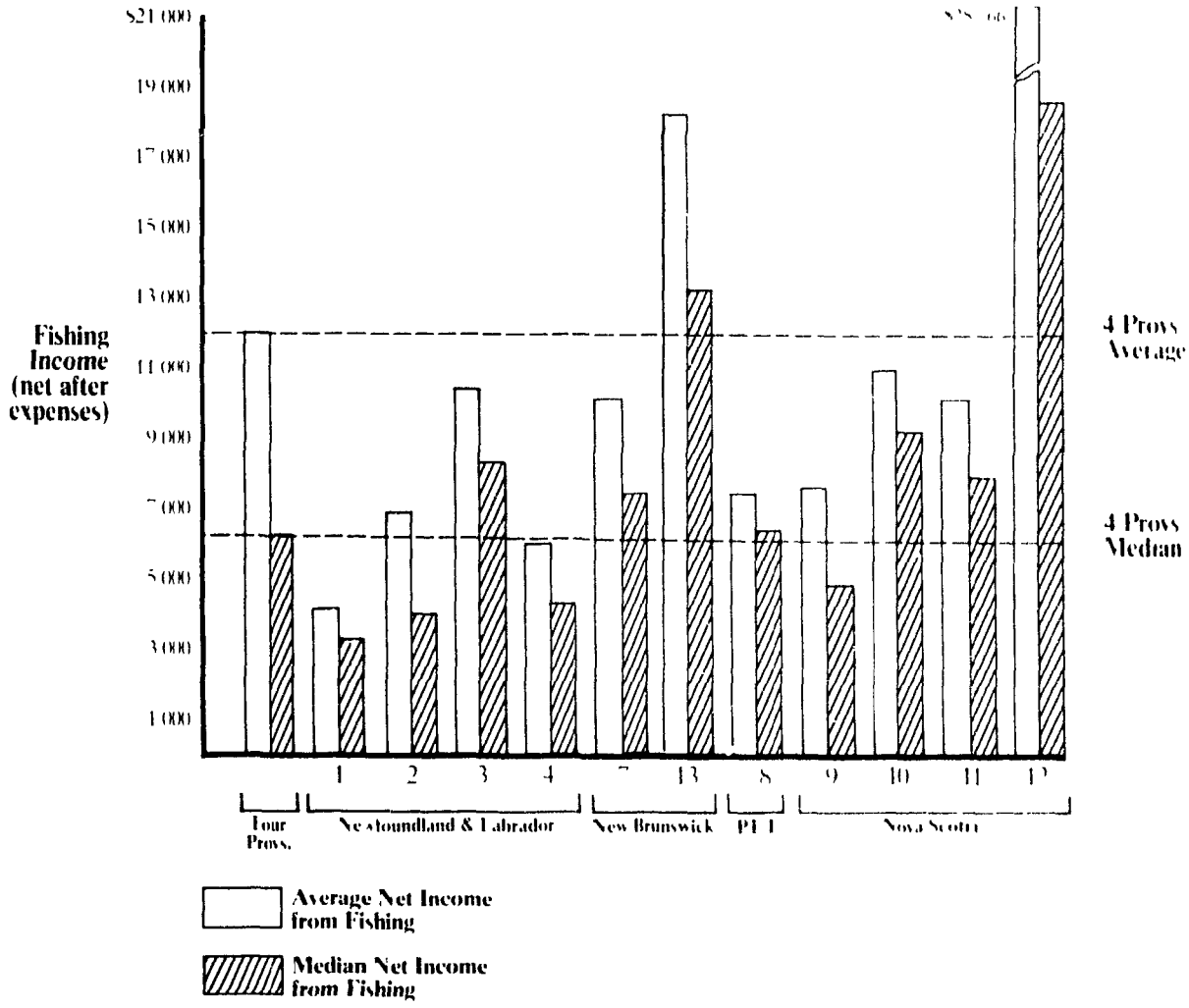
Portion of Licence Holders	Full-time	Part-time
25% (bottom quarter)	$2,731	$ 000
50% (median)	6,500	840
75% (third quarter)	14,680	3,100
90% (top decile)	23,350	6,000

Source: Kirby, M.J.L. 1982. Navigating Troubled Waters

Fig. 6-23 Distribution of net fishery income in analytical areas (full time fishermen).

Source: Kirby, M.L.J. 1982. Navigating Troubled Waters

Distribution of Net Fishing Income in Analytical Areas (Full-Time)



Overall, full-timers received an average of $3,837 from non-fishing sources and part-timers $8,409. The top 10 percent of part-timers received more than $19,176 from non-fishing sources.

Recently, Doug House, Chairman of the Newfoundland Royal Commission on Employment and Unemployment criticized the TFAF underestimation of the value of household production. House *et al* (1986) observed:

> "It completely ignores the most important components of household production in Newfoundland outports. First and foremost among these is housing. People build their own homes, and in concert with their relatives and their friends, they install their own plumbing, wiring, insulation and other services. Secondly, and of increased importance since the rise in world oil prices, people collect their own firewood to heat their homes. Thirdly, people do their own repairs and maintenance.... Fishing, hunting, gathering and growing food for the household's own consumption, the only item considered by Kirby, constitutes only a small part (around 10 percent) of household production."

House *et al* (1986) estimated that household production contributes at least a quarter of the economic value of a typical fisherman's economic output.

All sources agree that the total net incomes of fishermen are low. The TFAF figures for the average net income from all sources in 1981 were $15,791 for full-timers and $11,182 for part-timers. Again there was considerable variability among areas. From these observations, the TFAF concluded:

> "A sizeable majority of full-time fishermen on Canada's east coast have total incomes below the recognized poverty line for rural residents."

To address the poverty question appropriately, it is necessary to take into account household incomes. Average total household incomes for full-time fishermen were lowest in

northeast Newfoundland and Labrador ($14,319) and highest in southwest Nova Scotia ($35,882). Among part-timers, average total household incomes were lowest in Prince Edward Island ($12,002) and highest in southern New Brunswick ($25,952).

Table 6-9 shows the recognized poverty line figures from 1980 to 1988 for rural households of various sizes. The official rural poverty line for 1981 for a 4 person household was $12,035. Given that the average size of an Atlantic coast fisherman's household was 4.1 people, almost one-third of the households of full-time fishermen had total incomes below the poverty line. Among part-time fishermen, 40 percent of households had incomes below the poverty line. More significantly, total household incomes for a high proportion of full-time and part-time fishermen in northeast Newfoundland and Labrador, eastern Newfoundland, Prince Edward Island, the Gulf side of Nova Scotia and central Nova Scotia were well below the poverty line for rural Canada. Without the supplementation of incomes from non-fishing sources (particularly Unemployment Insurance and earnings by other household members), the majority of east coast fishermen's households would have been at or below the poverty line.

An important source of non-fishing employment for members of fishermen's households is fish processing plants. In the Atlantic as a whole, processing plants created as many jobs and almost as much income as fishing itself. The total number of person-years of employment was estimated to be around 31,000 in 1980. About 20 percent of fishermen's households had one or more members working in fish-plants. The links between fishermen's households and plant employment were strongest in Newfoundland and in northeast New Brunswick. Fish plant employment by wives or other residents of fishermen's households was an important factor in determining the proportion of households whose total income fell below the poverty line.

Table 6.9 Statistics Canada Revised Low Income Cut-offs, 1980-1988 for family sizes of 3, 4 and 5 persons residing in rural areas

	FAMILY SIZE		
YEAR	3	4	5
1980	$ 9,256	$10,699	$12,441
1981	10,412	12,035	13,995
1982	11,537	13,336	15,507
1983	12,203	14,106	16,403
1984	12,734	14,720	17,117
1985	13,244	15,310	17,803
1986	13,785	15,936	18,531
1987	14,389	16,634	19,343
1988	14,979	17,316	20,136

Source National Council of Welfare April 1989. 1989 Poverty Line Estimates.

More recent snapshots, from the 1984 and 1988 surveys of Atlantic fishermen by DFO, confirm the findings of the TFAF (Table 6-10). In 1984, the total net incomes ranged from $9,935 in Newfoundland to $18,028 in Nova Scotia. The distribution among provinces was similar to that observed for 1981, with total incomes being lowest in Newfoundland and highest in Nova Scotia. Other employment income was generally between $1000 and $2000, with the exception of Nova Scotia where it was slightly higher. Overall, the net total income (before taxes) was up only slightly from 1981. This is not surprising given that the early 1980s were recession years and the "restructuring" of the Atlantic fishery was not completed until 1984-85.

The figures for 1988 show net total fishing income was up by 50 percent or more from 1984. This reflects the market boom from 1985 to mid-1988. In 1988, other employment income was in the $2000-$3000 range, also reflecting an approximate 50 percent increase.

The 1984 and 1988 surveys did not continue the collection of information on household incomes. Looking just at the average net total incomes, in 1981 the figure for full-time fishermen ($15,791) was equivalent to the rural poverty line for a family of six. The average for part-time fishermen was equivalent to the rural poverty line for a family of three. In 1984, the average net total income (full-time and part-time fishermen combined) was equivalent to the rural poverty line for a family of two in Newfoundland, a family of three in Prince Edward Island, and a family of four-five in Nova Scotia. In 1988, the average net total income was equivalent to the rural poverty line for a family of three in Newfoundland, a family of five in Prince Edward Island, and higher than that for a family of seven or more in Nova Scotia.

Table 6.10 Income summary, all active fishermen by province, 1984 and 1988

	Nova Scotia	New Brunswick	Prince Edward Island	Quebec	Newfoundland
	1984				
Gross Fishing Income	$21,373	$16,749	$15,768	$11,298	$ 8,703
Fishing Costs	(8,438)	(7,113)	(7,375)	(5,813)	(3,380)
Other Employment Income	2,397	1,760	1,014	1,645	1,214
Regular UI	555	1,134	1,294	1,254	713
Fisherman's UI	2,141	2,751	3,262	2,237	2,685
Total Income	$18,028	$15,281	$13,963	$10,621	$ 9,935
	1988				
Gross Fishing Income	$28,406	$24,221	$22,302	$24,981	$10,979
Fishing Costs	(9,823)	(11,126)	(8,418)	(13,299)	(3,385)
Other Employment Income	3,223	2,501	1,488	1,974	2,294
Regular UI	876	3,493	2,036	957	1,133
Fisherman's UI	3,671	3,979	4,500	5,384	4,492
Total Income	$26,353	$23,068	$21,098	$19,997	$15,513

Source: DFO Statistics

1984 Survey of Atlantic Fishermen, Economic and Commercial Analysis Series, Department of Fisheries and Oceans, Survey and Statistics Report No. 37. November 1987 and preliminary information from the 1988 survey of Atlantic Fishermen

Although the comparisons are inexact, it appears that fishermen's incomes improved in relation to rural poverty line figures in the mid-1980s. This reflects the general economic upturn in the Atlantic fishery related to considerably increased prices for fish products in the U.S. market. Fishermen's incomes improved somewhat as a result of the generally prosperous conditions in the fishery.

Recent results confirm the findings of the TFAF with respect to the considerable variability among areas in fishermen's incomes, related to species fished, length of the fishing season and gear type. Fishermen who hold restricted licences for lucrative species such as lobster and licences for purse seine or small mobile gear tended to outperform the average substantially. Nova Scotia fishermen continued to earn the highest incomes on the Atlantic coast. Similarly, Newfoundland inshore fishermen with short seasons and limited species availability continued to earn the lowest incomes. In 1984, the average total income in Nova Scotia was double that in Newfoundland. In 1988, the average total income in Nova Scotia was 70 percent greater than that of Newfoundland fishermen. The average gross fishing income in Nova Scotia was almost triple that in Newfoundland but that was offset somewhat by lower fishing costs in Newfoundland and higher average transfer payments (Unemployment Insurance) (Economics Branch, DFO, Ottawa, Personal Communication).

The fishing industry in British Columbia is highly dependent on salmon and herring. These species exhibit considerable variability in landings and landed value. In the late 1970s, fishermen's incomes in British Columbia were the highest in Canada, and over 50 percent higher than the overall average income for the province. In 1980, a year of crisis, their incomes fell to less than 80 percent of the provincial average. Their incomes remained below average until 1985 when their income increased to five percent above the provincial average.

6.3. Unemployment Insurance

6.3.1. General

The survival of many coastal fishing communities and fishermen's households has been dependent upon the availability of Unemployment Insurance Benefits over the past three decades. Unemployment Insurance for Self-Employed Fishermen was introduced in 1956, with fishermen first becoming eligible in April 1957.

Currently there are three UI programs which cover fishermen:

1. Fishermen who are employees of a fishing enterprise are covered by the regular UI program;
2. Those who are self-employed are covered by two special fishermen's programs:
   a) one for individuals involved in seasonal fishing; and
   b) one for year-round fishermen.

In general, self-employed workers are not covered by UI because they are not covered by "a contract of service". Fishermen are an exception to this exclusion (Forget, 1986).

6.3.2. Cost of UI

In 1987, payments under Fishermen's U.I. totalled $223 million or two percent of payments made under regular UI. Federal government contributions to Fishermen's UI totalled $201 million in 1986/87 or seven percent of its contributions to the regular UI program.

The payments under Fishermen's UI differ significantly among regions. In 1987, 36.5 percent of the payments ($80 million) went to Newfoundland, 20 percent ($45 million) to Nova Scotia and 17 percent ($40 million) to British Columbia. New Brunswick, Québec and Prince Edward Island received 9 percent, 8 percent and 7 percent respectively. Details on payments for the 1972-1988 period are given in Table 6-11.

Table 6.11 Fishermen's Unemployment Insurance by province and national totals 1972-1988

	Newfoundland		P E I		Nova Scotia		New Brunswick		Quebec		British Columbia		Total
Year	Total Payments $'000	% Of Total $'000	Total Payments $'000	% Of Total $'000	Total Payments $'000	% Of Total	Total Payments $'000	% Of Total	Total Payments $ 000	% Of Total	Total Payments $'000	% Of Total	Total Payments $'000
1972	4471	23 1	1592	8 2	4811	24 9	2079	10 8	1087	5 6	5280	27 3	19320
1973	4638	24 3	1312	6 9	4696	24 6	1966	10 3	1078	5.6	5424	28 4	19114
1974	5026	23 2	1634	7 6	5684	26 3	2127	9 8	1411	6 5	5741	26 6	21623
1975	4423	19 7	2066	9 2	6375	28 4	2130	9 5	1502	6 7	5978	26 6	22474
1976	6465	23 5	1923	7 0	7333	26 7	2646	9 6	2036	7 4	7101	25 8	27504
1977	13207	28 3	3432	7 4	9991	21 4	4938	0 6	3574	7 7	11466	24 6	46608
1978	18948	30 9	5035	8 2	12411	20 2	6732	11 0	4814	7 9	13372	21 8	61312
1979	24608	35 5	5900	8 5	13413	19 3	7342	10 6	6008	8 7	12137	17 5	69408
1980	33039	41 0	7244	9 0	16251	20 1	8585	10 6	7076	8 8	8484	10 5	80679
1981	36980	41 0	7439	8 2	18321	20 3	8652	9 6	7917	8 8	10885	12 1	90194
1982	42033	38 6	8686	8 0	23734	21 8	10295	9 5	10058	9 2	14116	13 0	108924
1983	52536	38 2	10450	7 6	29479	21 4	12315	8 9	12030	8 7	20791	15 1	137601
1984	57313	36 1	12063	7 6	36226	22 8	14762	9 3	13306	8 4	25137	15 8	158807
1985	63414	36 3	13063	7 5	38442	22 0	16016	9 2	14422	8 2	29553	16 9	174910
1986	71954	35 2	15928	7 8	43698	21 4	18746	9 2	16553	8 1	37736	18 4	204615
1987	80002	36 6	15978	7 3	45156	20 6	20252	9 3	17637	8 1	39891	18 2	219026
1988	80184	37 7	14479	6 8	44043	20 7	18242	8 6	17762	8 4	37818	17 8	212528
Total	599321	35 8	128224	7 7	360064	21 5	157855	9 4	138271	8 3	290912	17 4	1647647

Source Grady P and D MacLean 1989 An Income Stabilization program for fishermen its need, feasibility and cost Global Economics Ltd Unpublished study undertaken under contract for the Department of Fisheries and Oceans Ottawa

6.3.3. Impact of Unemployment Insurance on the Incomes of Fishermen and Their Households

The Task Force on Atlantic Fisheries data showed that benefits received through the Unemployment Insurance program were a significant source of cash income for fishermen in all geographical areas.

On average, full-time fishermen received $2,466 in UI benefits in 1981, while part-time fishermen received an average of $1,483. UI payments constituted, on average, 16 percent of total net income (before taxes) for full-time fishermen and 13 percent for part-time fishermen. There was significant regional variation in the contribution of UI payments to net income. In northeast Newfoundland and Labrador, where earned incomes were lowest, UI payments made up 32 percent of average total net incomes for full-timers. This contrasted with western Nova Scotia where UI payments made up only six percent of average total net incomes for full-timers.

Nationally, in 1983, fishermen derived 72 percent of their earnings from fishing, 12 percent from other sources of earnings and 16 percent from Unemployment Insurance (DFO, unpublished data). This latter figure is identical to the TFAF figure for full-time Atlantic fishermen.

The percentage of income derived from fishing varied from a low of 63 percent in Newfoundland and 65 percent in British Columbia to a high of 80 percent in Nova Scotia. The percentage of income derived from UI payments varied from a low of 9 percent in the inland provinces and 11 percent in Nova Scotia to highs of 20 percent and 23 percent in Prince Edward Island and Newfoundland respectively (Table 6-12).

When UI is viewed solely in the context of net fishing income, the importance of UI as an income supplement looms larger. From the 1984 survey of Atlantic fishermen's incomes, fishermen's UI as a percentage of net fishing income was 29%, on average. 1988 figures confirm that UI has continued to

Table 6.12 Distribution of income from fishing versus that from Unemployment Insurance by province in 1983

	Number of Fishermen	% Income from Fishing	% Income from U.I.
Newfoundland	19,000	63%	23%
Prince Edward Island	3,500	72%	20%
Nova Scotia	13,000	80%	11%
New Brunswick	5,000	76%	15%
Québec	3,500	77%	18%
Inland	4,000	69%	9%
British Columbia	12,000	65%	14%
Canada	60,000	72%	16%

Source: Unpublished data, DFO, Economics Branch, Ottawa.

be an important income supplement, particularly in Newfoundland (Table 6-10).

When figures are broken down intraprovincially, the degree of dependence on UI payments for income supplementation in particular areas is even more evident. In northeast Newfoundland and Labrador, around 42 percent of income was derived from UI payments. On the south coast of Newfoundland (the trawler ports), on the other hand, income from fishing accounted for 77 percent of overall income and UI payments accounted for 17 percent, close to the national average for 1983. Within New Brunswick, there was also a considerable disparity in the contribution of UI payments to overall income - 24 percent on the Gulf shore of New Brunswick compared with only 9 percent on the Fundy shore. This latter area has a year-round fishery and access to lucrative species such as scallops.

The important income supplementation role of the Fishermen's UI program was recognized by the Task Force on Atlantic Fisheries (Kirby 1982) and the House Commission on Employment and Unemployment (Newfoundland 1986). When it was introduced, Fishermen's UI was supposed to be a temporary program, pending the development of a more satisfactory means of income support. No satisfactory alternative has been devised and it survived intact the 1989 changes to the Unemployment Insurance Program.

Despite calls by the MacDonald Commission, the Forget Commission, and the House Commission in Newfoundland for the replacement of Fishermen's UI by a broader system of income supplementation, the Unemployment Insurance Program and Fishermen's UI, in particular, continue to supplement inadequately low incomes in most of Canada's coastal fishing communities. Despite the deficiencies that have been identified, it appears that the UI program will continue to be the primary means of addressing this ongoing problem of income inadequacy for the foreseeable future.

7. CONCLUSION

Achievement of the potential economic benefits made possible by the Canadian 200-mile fisheries zone has been stymied by a combination of factors. These include: natural resource variability, the common property nature of the resource, problems in managing transboundary stocks and stocks which straddle the 200-mile limit on the Grand Banks, market fluctuations and certain social constraints posed by chronic dependence on the marine fisheries as the primary source of income in many hundreds of coastal communities

The Canadian fishing industry in general, and the Atlantic groundfish industry in particular, have been characterized by boom and bust periods alternating every few years. Unpredictable fluctuations in resource abundance, excessive dependence on the U.S. market in the case of groundfish, and a general vulnerability to recessionary cycles in the economy, have all combined to varying degrees to produce periodic crises in the industry. In the case of Atlantic groundfish, some commentators have suggested that there have been regular downturns every 5-6 years since World War II. Although there were fluctuations in the saltfish industry (Alexander, 1977; Ryan, 1986) primarily due to market factors, there is little evidence to support regular downturns in the frozen groundfish industry prior to the crisis of 1967-69. Since then there have been alternating periods of boom and bust with major crises occurring in 1974-75, 1981-83 and another commencing in late 1988-early 1989. While these crises have been spaced about 6-7 years apart, the factors precipitating the downturns have varied from one crisis to the next. The 1967-68 downturn resulted from problems in the U.S. groundfish market. The major crisis of 1974-75 resulted from a combination of low resource abundance, rising costs and a market downturn. The 1980-83 groundfish crisis was the result of overexpansion in the processing sector financed by excessive debt in the euphoria following the 200-mile limit.

When high interest rates of 20 percent plus struck during the Great Recession of the early 1980s, the offshore groundfish sector became insolvent. In 1989, downward adjustments in the TACs for many stocks, continued overcapacity, and a temporary softening in the U.S. market combined to produce the third major Atlantic groundfish crisis in less than two decades.

Following each crisis, the industry has experienced boom conditions for a period of 3-4 years during which the problems of the past are rapidly forgotten. Everyone rushes to capitalize on the opportunities of the moment, forgetting that there is a tomorrow. Major government financial assistance in 1974-75 through the Bridging and Temporary Assistance Programs and in 1983-84 through the financial restructuring of the large offshore companies failed to buffer the industry against the shocks of subsequent downturns and failed to provide stability. Hence, the industry was again plunged into crisis in 1989 when TACs had to be adjusted downwards because of resource fluctuations and reassessment of the status of certain stocks.

The 200-mile zone brought significant benefits to certain sectors of Canada's marine fisheries. It did not, however, remove various obstacles to an economically viable fishery which have persisted despite the 200-mile zone. These obstacles are features of an underlying fisheries management dilemma which is as problematic today as in the pre-extension era.

CHAPTER VII

CONFLICTING OBJECTIVES - THE FISHERIES MANAGEMENT DILEMMA

1. INTRODUCTION

Given the boom-and-bust pattern evident in three major fisheries crises on the Atlantic coast in the past 20 years and at other intervals in the Pacific fisheries, one may well question the effectiveness of Canada's management of its marine fisheries. It is difficult to assess the relative success (or lack thereof) because of (1) the lack of a consistent, weighted framework of specific management objectives, and (2) the wide diversity of fisheries and circumstances involved.

The three major crises described in the previous chapter were due to different combinations of factors. The 1974-1976 crisis resulted from a resource decline due to foreign overfishing, combined with a market downturn. The crisis of the early 1980s was primarily the result of debt-financed overexpansion which crippled the industry when interest rates rose to 20% plus. The 1989-1990 crisis was the result of a reduction in TACs due to a resource downturn in some stocks and a reassessment of the status of the major northern cod stock, combined with further growth in onshore processing capacity in the mid-1980s and continued fleet overcapacity in some areas.

The one common feature of these crises was the inability of the fishing industry to withstand downturns, whether precipitated by resource, market or financial factors. A major contributing factor to this vulnerability is the continued tendency to overcapacity in both the harvesting and processing sectors. Excess capacity is a feature of most fisheries. This overcapacity has its roots in the multiple

conflicting objectives of fisheries management and the common property nature of the resource.

2. CONFLICTING OBJECTIVES

In 1976, Canada, like the United States, embraced the concept of optimum yield, or "best use" as it was called in the Policy for Canada's Commercial Fisheries, as the objective of fisheries management. "Best use" was intended to encompass biological, economic and social considerations. This was to replace the traditional reliance on Maximum Sustainable Yield as "the" objective of fisheries management. MSY had come under assault, particularly by fisheries economists who argued that the appropriate management objective was Maximum Net Economic Yield (MEY). Both MSY and MEY were subsumed in the diffuse optimum yield concept. Wooster (1988) in his book Fishery Science and Management: Objectives and Limitations observed:

> "Biologists have played a major role in fishery management from its inception. Until recently they dominated management decisions on the quantities of fish to be caught and to some extent the allocation of such catches, at least among different types of gear. But since fishing is conducted for money, food or other social or political benefits, not for the welfare of the exploited stock, the role of the biologist has narrowed to that of evaluating the state of stocks, and of predicting the consequences of different patterns and intensities of exploitation. If it becomes politically desirable to fish a stock to levels less than optimal or to expend inordinate effort in doing so, the biologist has a responsibility to evaluate and point out the effect on the stock. As biologist, however, he has no particular competence in criticizing the selection of political objectives. Allocation is a political, not a biological problem."

In 1982, the Task Force on Atlantic Fisheries proposed a ranked set of objectives for Atlantic fisheries policy which was endorsed by the government of the day (Kirby, 1982). These objectives, in order of priority, were: (1) economic viability; (2) maximization of employment with an acceptable income constraint; and (3) Canadianization of the fishery. Conspicuous by its absence was a reference to the traditional resource conservation objective. Pearse (1982) promoted economic rationalization but emphasized resource conservation as the paramount federal government fisheries obligation. The 1985 Study Team on Natural Resources recommended that the conservation and enhancement of natural fisheries resources in the wild be reemphasized as the chief objective of fisheries management (Canada, 1985).

Many observers of the fisheries scene have argued that, in the absence of a clear, systematic, hierarchial set of objectives, there can be no rational fisheries policy. The reality is that in Canada, as elsewhere, fisheries managers are faced with multiple conflicting objectives for fisheries management which shift over time. Official objectives tend to be stated as a general framework, incorporating biological, economic and social dimensions, with the balance and relative weights attached to component subobjectives shifting from time to time and from fishery to fishery.

While considerable lip service has been paid in recent decades to the economic rationalization/viability objective, social factors have played a large role in shaping fisheries policy. Maximizing employment within a constraint of "reasonable" incomes from fishing has been a dominant consideration. The tug-of-war between economic and social objectives has waxed and waned. Trade-offs occur as governments seek to achieve both.

There has, however, been general agreement, with a few exceptions, that resource conservation should take precedence over economic and social considerations when there is a threat

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There has, however, been general agreement, with a few exceptions, that resource conservation should take precedence over economic and social considerations when there is a threat

to the future of the resource. This is not because fishermen, managers or politicians are ichthyo-centric but because conservation is like motherhood - nobody can be against it.

When the survival of the resource is not at stake, economic/social factors will often take precedence over the achievement of some arbitrary biological reference point, whether it be MSY, $F_{0.1}$, or something else. Examples include increasing the TAC for Gulf snow crab in order to lengthen the season and provide more weeks of work for processing plant workers. Another example is the attempt in the 1991 Multi-year Groundfish Management Plan to minimize the disruptive effects of dramatic adjustments in TACs suggested by the stated objective of fishing at $F_{0.1}$ (e.g. the government's response to the CAFSAC reassessment and the Harris Panel advice for lower TACs for northern cod).

Attempts to forge a clear, national, hierarchial set of fisheries management objectives, with relative weights to the various components, are probably doomed to failure in a country with fisheries as diverse as those in Canada.

Ultimately, society through the political system determines what the objectives of fisheries management will be. Thus, the interpretation of "best use" is subject to change. What is "best" will vary from time to time and from fishery to fishery. National objectives for fisheries management are likely to remain vague. This does not mean that we should abandon all efforts to develop clear, explicit, ranked and measurable objectives for fisheries management. It does mean, however, that such efforts will have a greater probability of success if they are fishery-specific. Sophisticated tools exist to assist managers in this process (e.g. Healey, 1984). These should be tested to determine the optimum yield for particular fisheries. The weight given to biological, economic and social factors will vary according to circumstances appropriate to that fishery.

3. HAVE MANAGEMENT OBJECTIVES BEEN MET?

3.1 Conservation Objectives

In terms of conservation, Canada's track record with respect to marine fisheries has been generally successful. The Fisheries Act which provides the legal basis for most of the fisheries management activities of the Department of Fisheries and Oceans, refers explicitly to "conservation and protection" (Section 43). Almost all of the Fishing Plans which have been developed in the past decade or so refer to conservation and protection as a primary objective or basic principle but very few define what is meant by conservation.

Since DFO has never adopted a definition of conservation, it is useful to examine the definition adopted by the Department of the Environment in 1986, in the context of the UNEP World Conservation Strategy. It defined conservation as:

> "That aspect of renewable resource management which ensures that utilization is sustainable and which safeguards ecological processes and genetic diversity for the maintenance of the resources concerned. Conservation ensures that the fullest sustainable advantage is derived from the living resource base and that facilities are so located and conducted that the resource base is maintained".

Conservation is sometimes viewed as synonymous with preventing overfishing. Generally two types of overfishing are distinguished - growth overfishing and recruitment overfishing. Both growth overfishing and recruitment overfishing have sometimes been used as diagnostic tools to measure the degree to which fishery management plans meet conservation objectives. I believe this defines "conservation" too broadly. Growth overfishing is really an economic rather than a biological or resource concern. It is more appropriate to evaluate whether the conservation objective has been met in terms of recruitment overfishing or,

more specifically, whether the survival of a stock or group of stocks is threatened.

Viewed in this light, Canada's management efforts have generally, but not always, prevented recruitment overfishing. The most likely exceptions are three haddock stocks on the Scotian Shelf and Georges Bank and certain anadromous stocks on both the Atlantic and Pacific coasts. Compared with most other countries, Canadian marine fisheries management has been relatively successful in meeting the conservation objective(s), even though the latter has been poorly defined (M. Sinclair, Halifax, Personal Communication).

Although specific management targets, e.g. the $F_{0.1}$ reference fishing mortality for Atlantic groundfish, have been exceeded in some instances, there are only a few examples where the survival of a marine fish stock in Canadian waters has been placed in jeopardy by fishing. Nonetheless, there is sometimes a perception of failure because of the divergence between expectations and "reality", e.g. the reassessment of Northern Cod in 1989. This divergence is a feature of the inherent inadequacies of the scientific data base and existing models. Despite perceptions in some quarters that management of the northern cod stock has been a "failure", in conservation terms the management program has been successful. The stock more than doubled in size between 1976 and 1984 and is holding its own. This cod stock is certainly not threatened in any ecological conservation sense. While the stock size now appears to be less than formerly thought, it is still abundant and should continue to sustain a major fishery.

3.2 Economic Objectives

Since the late 1960s, Canada has placed considerable emphasis upon creating a more economically efficient fishing industry. Although economic objectives have often not been clearly articulated, from the late 1960s onward they have been

influential in shaping fisheries policy and management initiatives. Canada's track record in meeting economic efficiency/viability/profitability objectives has been less impressive than its conservation record.

The management tool favoured by economists in the late 1960s-early 1970s to achieve a more economically efficient fishery was limited entry licensing coupled with restrictions on vessel size/capacity. Canada adopted limited entry licensing for most of its major fisheries during the period 1967 to 1973.

Despite numerous attempts to bring capacity more in line with the available resource, excess capacity continues to be a problem in many Canadian fisheries. This failure to meet economic objectives is rooted in the common property nature of fisheries resources. The common property race for the fish has led inexorably to excess capacity in most fisheries. The use of limited entry licensing in Canada to curb overcapacity and the tendency to overinvest has met with a mixture of success and failure. By the late 1970s, it appeared that limited entry licensing/capacity controls were not having the desired impact in constraining and/or reducing fleet overcapacity. Based on the B.C. salmon licensing experience, many analysts of fisheries management became increasingly pessimistic about the utility of limited entry licensing as a means to curb overcapacity. This view is supported by the experience in the inshore-nearshore groundfish fishery on the Atlantic coast, particularly the overcapacity problem in the southwest Nova Scotia dragger fleet.

The experience in the Atlantic lobster fishery has been more positive. In this fishery, limited entry licensing has had a beneficial impact by constraining additional entry under circumstances of a resource resurgence. Similarly, limited entry licensing and vessel replacement controls restrained the growth of capacity in the offshore groundfish fleet on the Atlantic coast.

Many of the perceived shortcomings of limited entry can be traced to the fact that limited entry is usually introduced late in the game, after the problem of overcapacity has become perhaps uncontainable or insoluble. One of the fundamental challenges is what to do in such overcapacity situations. Licence buy-back schemes have been tried in certain fisheries. The Atlantic Lobster Licence Buy-Back program in the early 1980s was successful in reducing the number of participants in the Atlantic lobster fishery. Properly designed buy-back programs remain an option to reduce fishing capacity in fisheries where significant overcapacity exists. Two other approaches in the form of output control, taxation and Individual Transferable Quotas (ITQs), have been suggested as more effective rationalization schemes. Although advocated by some economists, taxes or royalties have found little or no acceptance in practice as a fisheries management tool. During the 1980s, the concept of individual quotas was widely debated and tested in several major fisheries on Canada's Atlantic coast, and, to a lesser extent, on the Pacific coast. Based on that experience, it seems clear that individual quotas are an effective management tool to foster economic viability in some, but not all, fisheries. Reduction of gluts, the landing of better quality fish, the reorientation from a volume-driven to a market-focused fishery, and fleet rationalization (i.e. reduction) are all tangible benefits which are being achieved in the various Canadian experiments with individual quotas.

Individual quota management seems best suited to foster economic viability in fisheries where:

1. The resource is relatively stable.
2. The number of enterprises is relatively small, perhaps tens or a hundred participants rather than thousands.
3. The number of landing points is relatively small and easily accessible to enforcement personnel.

4. There is formal organization of the enterprises into effective associations that can speak for, and negotiate on behalf of, the members.
5. There is a recognition by the participants of the negative effects of "the race for the fish" under open access conditions and a collective willingness to experiment with innovative approaches.
6. There is a voluntary commitment to comply with an individual quota regime and to assist in its enforcement.

Individual quotas will work in some fisheries but not in all. They are a promising tool to reduce the incentive for a fisherman to maximize his share of the catch and hence build bigger and better boats to assist in the attainment of that maximum share. Like all fisheries management tools, individual quotas have drawbacks, the most serious of which is the incentive to cheat and hence the need to design adequate mechanisms to ensure compliance.

3.3 Social Objectives

The fisheries are a vital source of employment and income in more than a thousand coastal communities. Although social objectives for fisheries policy have rarely been clearly articulated, social considerations have often had a major impact on the fisheries management decision-making process.

In many instances, community survival is closely linked to the fate of the fishery in a particular region. The closure of a fish plant can put hundreds of people out of work and, in one-industry towns, threaten the future of that community. It is for this reason that rationalization of excessive onshore processing capacity was bitterly opposed by community groups in the Atlantic fisheries restructuring debates of the early 1980s and again in the 1989-1990 Atlantic fisheries crisis.

Not only does the fishery provide jobs. It is relied upon as the "ticket of entry" to the unemployment insurance social safety net. Fisheries policy and management initiatives have often been called upon to serve social goals of maximizing employment and supporting community maintenance in areas where there are few alternative employment opportunities. This has often distorted management initiatives aimed at conserving stocks or improving the economic viability of particular fisheries. Numerous regional economic development programs and initiatives have been undertaken over the past several decades in an effort to diversify the economy of the Atlantic provinces and reduce regional disparity. Regrettably, most of these programs have failed to foster meaningful economic diversification. This has generated a continuing demand that the fisheries support those who are unable to find alternative employment within the region. This demand has resulted in too many fishermen chasing too few fish. This has also created a self-perpetuating cycle of low or poverty-level incomes in fishing communities. Reliance on the fisheries as the employer of last resort has stymied attempts to achieve economic viability in particular fisheries.

3.4 Stability

Although stability has never been explicitly adopted as a Canadian fisheries management objective, it was a recurrent theme through the 1970s and 1980s. The 1976 Policy for Canada's Commercial Fisheries suggested that "the fishery economy of the future would be a vigorous and stable one" (DOE, 1976b). The 1981 Policy for Canada's Atlantic Fisheries in the 1980s stated: "In the 1980s resource harvesting policies will aim at increasing the economic viability and stability of the Atlantic commercial fisheries" (DFO, 1981b). It suggested that setting TACs at or below the $F_{0.1}$ level would

provide for "stock rebuilding, larger average size of fish in the catch, improved catch rates and greater stability of catches." The first Annual Report of DFO for 1979-80 stated:

> "During the year under review the department continued to concentrate its efforts on achieving stability and increasing viability in the fishing industry across Canada." (DFO, 1980)

It is evident that the theme of fostering and achieving stability was a major goal in the decade following extension of jurisdiction. To some extent, the scientific community lent credence to this goal.

It is clear in hindsight that attempts to achieve stability in fisheries were doomed to failure. While there can be some relative stability, fisheries are prone to fluctuations because of diverse, complex factors which lie beyond the control of fisheries managers. Over the first post-extension decade, it was widely assumed that stability in TACs and catches could be achieved. Thus, downturns in certain stocks came as a major shock to certain segments of the industry in the latter part of the 1980s. Such fluctuations are, however, but one feature of the fisheries management dilemma.

4. THE FISHERIES MANAGEMENT DILEMMA

The crux of the fisheries management dilemma can be found in the nature of the fisheries system which encompasses the resource, the harvesting, processing and marketing sectors, and the people involved in all facets of the fishing industry. This system is characterized by:

1. Natural resource variability, often environmentally induced;
2. The common property nature of the resource which leads to overcapacity in both harvesting and processing;

3. Fluctuations in market conditions similar to, but not necessarily in tandem with, resource fluctuations;
4. Heavy dependence on the fisheries in isolated coastal communities with few alternative employment opportunities;
5. Heavy dependence on government support programs such as Unemployment Insurance;
6. Tremendous diversity among fisheries;
7. Recurrent conflict among competing user groups;
8. Conflicting objectives for fisheries management (see above discussion);
9. The migratory nature of fish stocks necessitating bilateral and multilateral management of transboundary stocks; and
10. The necessity to manage despite uncertainty in scientific advice.

4.1 Resource Variability

In the increasing attempts to manipulate or manage fisheries over the past three decades, fisheries managers have relied upon the output from scientific models. These models generally assume steady-state equilibrium conditions, conditions which in fact are rarely found in fisheries systems. The role of natural resource variability was generally underestimated or downplayed as scientists strove to provide simple answers to complex questions. Although it has long been known that large-scale fluctuations in fish stocks can occur because of environmental factors, there is now increasing recognition that environmental perturbations can overshadow the effects of fishing. Hence, attempts to stabilize yield through regulation of fishing will often be foiled by natural events beyond man's control.

4.2 The Common Property Problem

The effects or the common property nature of fisheries resources are well documented. The race for the greatest share of the available pie leads inexorably to excess capacity in harvesting and processing. Around the world fisheries managers are struggling to find ways to remove this incentive for destructive competition. Canadian attempts to address this problem through limited entry licensing have met with only limited success. Recent experiments with individual quotas offer greater promise of success.

Onshore processing falls under provincial jurisdiction with provinces competing for the available resource in the same way that individual fishermen do. They want to secure the maximum economic and employment benefits for their own people. Hence, they have been slow to act to halt the build-up in excess onshore processing capacity.

On the Atlantic coast, two major surges in processing capacity occurred in the late 1970s and in the mid-1980s. Only recently have some provinces, e.g. Nova Scotia, even begun to licence processing operations. Attempts to reduce excess processing capacity have foundered on the shoals of provincial rivalries and political imperatives to maximize employment and maintain existing settlement patterns.

Canada's fisheries are heavily export-oriented and dependent on conditions in foreign markets, particularly the United States. Market demand for fishery products, while generally trending upwards over the past couple of decades, is prone to fluctuations. When market conditions are favourable, e.g. from 1985 to 1988, the fishing industry tends to overinvest, forgetting previous downturns. When market corrections occur or market demand stagnates or decreases because of general economic conditions, the effect is felt throughout the fisheries system.

Excess capacity makes the fisheries system particularly vulnerable to resource and market fluctuations, general

recession conditions or even monetary policy. The dependence on the fishery to provide employment and to maintain communities in isolated coastal regions exacerbates this vulnerability. It is, therefore, not surprising that there is a heavy dependence on government support programs even in so-called "normal" times and particularly so in times of crisis.

The results of this fisheries management dilemma have been a recurrent boom-and-bust pattern, recurrent crises, and recurrent demands for government financial assistance. Governments have repeatedly stepped in with financial assistance in one form or another to minimize the impact in terms of increased unemployment, plant closures and communities thrown into turmoil. Often the full range of social and economic policy instruments of the federal government have had to be brought to bear to prevent a crisis from becoming a catastrophe in economic and social terms. The question of what to do under these circumstances becomes a major government policy issue and can no longer be confined to fisheries management in the traditional sense.

4.3 Reconciling Conflicting Interests

Another major feature of the fisheries system is the extent and all-pervasive nature of conflict among groups involved with the fishery. It has long been recognized that fisheries are characterized by conflict. Group is often pitted against group in the struggle for the greatest share of the available resource. Values and beliefs over how the resource should be managed and shared frequently clash. Day after day, week after week, month after month, year after year the media report countless examples of fisheries-related conflict. These examples range from the trivial to major controversies which involve most of the significant players in the fishing industry, as well as occasional violence (usually limited to property destruction).

Conflict may be as minor as a dispute between fishermen over the deleterious effects of using a particular type of fishing gear. On the other hand, conflict between countries over fish quotas and the appropriate management of fish resources can have an adverse effect on general relations. Conflict over access to and allocation of limited fish resources is perhaps the fundamental conflict in fisheries, next to the conflict among the multiple objectives of fisheries management.

Ultimately, decision-making authority on marine fisheries matters is vested in the federal Minister of Fisheries and Oceans, or the federal Cabinet for issues which transcend purely fisheries concerns. The Minister and the Department have to respond to a multitude of "publics". The federal Minister is bombarded by representations from commercial, recreational and native fishermen, provincial governments, foreign governments and international agencies, to cite just a few. He cannot ignore the claims and counterclaims of these and other interest groups. Because DFO is allocating the opportunity for wealth and the right to earn a livelihood from fishing, it is continually placed in the position of having to reconcile conflicting interests. The Minister in particular is faced with the difficult task of rendering decisions which are perceived as fair and reasonable by that vast multitude of interested parties. Given the wide diversity of those interests, the challenge has been to design structures which allow for meaningful input from all groups with a stake in how the fisheries are managed while, at the same time, avoiding policy paralysis.

From my observations, it appears that the government bureaucracy has adopted a variety of decision-making approaches based on the theory of the "rational" approach to problem-solving. In practice, however, decision-making in the fisheries management arena is characterized by incremental adjustments to policy, based on interactive processes. While

there is intellectual analysis, policy is shaped by group struggle, the struggle of conflicting interests. Government institutions and officials play an influential role in shaping policy as they attempt to reconcile those interests. In matters involving fisheries a multiplicity of groups speak with a thousand voices rather than a single voice. To deal with this, the federal government during the 1970s and 1980s created an elaborate consultative framework to provide fora for bringing these differing views to the same table. Sometimes these processes result in consensus on advice to the department or the Minister. On many occasions, consensus cannot be achieved, and the Minister has to step in and choose among several alternatives, arbitrating between the opposing viewpoints. In most instances where consensus is achieved, this is influential in shaping the policy outcome.

Fisheries managers, both bureaucrats and politicians, cannot expect to be loved. The task of balancing diverse and conflicting interests is frequently a thankless one. Absolute consensus is not a realistic goal in fisheries management. As more people and interest groups become involved in the formulation of fisheries policy, the greater is the likelihood that at least some of them are going to be disappointed by a specific decision. The goal is not to eliminate conflicting views about the appropriate course of action in any given situation but to manage conflict constructively. While the government can suggest dimensions for possible compromise, ultimately the goodwill of the users themselves determines the possibility for compromise and accommodation of conflicting interests.

4.4 Migratory Stocks - The International Dimension

The proclamation of a 200-mile fisheries zone in 1977 brought valuable fish resources under Canadian jurisdiction. However, important stocks of interest to Canada straddle the 200-mile limit on the Nose and Tail of the Grand Banks and

migrate into the waters of adjacent coastal states. Canada led the way in putting in place a new international mechanism to manage stocks beyond the Canadian 200-mile zone on the east coast, i.e. NAFO. Despite this, overfishing of stocks beyond 200 miles became a matter of increasing concern in the late 1980s.

Initially, Canada's international fisheries policy post-extension focused on securing both conservation and market benefits for Canada from the allocation of surplus fish in the Canadian zone. There were attempts to negotiate long-term arrangements for improved market access in return for assured allocations in the Canadian zone. By the early 1980s, it became evident that these initiatives were of dubious benefit. The problem of foreign overfishing intensified with the accession of Spain and Portugal to the European Community in 1986.

Canada intensified its efforts to bring the foreign overfishing problem under control by attempting to persuade the European Community to accept and implement NAFO TACs and national quota allocations. A concerted Ministerial-level campaign to persuade the Community to change its approach appeared to be yielding some benefits by the end of 1990. The European Community complied with certain NAFO quotas but continued to set a unilateral Community quota for northern cod on the Nose of the Grand Bank beyond 200 miles. Given the upheaval on the domestic fisheries scene in 1989 and 1990 resulting from revised scientific advice for this stock, the EC's actions were still far from satisfactory to Canada. Continued uncertainty about how the international fisheries management regime will evolve in this area introduces another element of instability into the Atlantic fisheries management picture.

Canada's attempts to negotiate maritime boundaries and transboundary fisheries management agreements have met with only limited success. Canada's fisheries relations with

Denmark (Greenland), France and the United States in the post-extension era have demonstrated that the goal of cooperative management of transboundary resources is more elusive than the drafters of the 1982 Law of the Sea Convention envisaged. Where the fisheries management systems of two countries differ radically, as in the case of Canada and the United States on the Atlantic coast, this task is even more difficult. Because fish migrate across man-made boundaries, these migrations will continue to complicate the task of fisheries management.

4.5 Science and Management

4.5.1 Managing Under Uncertainty

The complex fisheries management system that has evolved over the past several decades is heavily dependent on fisheries science. Effective fisheries management requires timely and reasonably reliable scientific advice.

The role of fisheries science is to project the likely effects and interactions of particular management measures so that the management agency can make an appropriate choice of measures within the context of its objectives for fisheries management. Great strides have been made since the 1950s in scientific understanding of the marine ecosystem, fish stock distribution and abundance, and in modelling the effects of fishing on fish abundance. Increasing demands are being placed upon scientists to generate advice on a routine basis for the year-to-year adjustment of catch quotas or prediction of the size of spawning runs of salmon.

The 200-mile limit permitted the introduction of a more conservative management regime which assisted stock recovery. When stocks and allowable catches were on the increase, the scientific advice tended to go largely unchallenged, with some local exceptions. In the late 1980s, however, the post-extension stock recovery on the east coast levelled off and some stocks experienced dramatic downturns in abundance. The scientific perception of the status of other stocks also

changed quite radically (e.g. northern cod). It was found that the models being used tended to overestimate stock abundance and underestimate fishing mortality.

Scientific assessments of fish stocks and advice on resource management have come under increasing criticism in recent years. This has been manifested in denunciations by the fishing industry of the scientific advice and, in particular, criticism of the failure of scientists to take fishermen's observations and knowledge into account in the resource assessment process. It is not uncommon for fishermen and other sectors of the fishing industry to criticize the validity of the scientific methodology and to distrust sometimes the motives of scientists in describing the implications of alternative management options.

It is not generally recognized that a changed perception of stock status, as the result of improvements in the data base or improved analytical techniques, is an integral part of the scientific process. Collection of new data and development of new techniques will often invalidate previously held hypotheses. The accuracy of projections by Canadian scientific advisory bodies is no worse, and probably no better, than that of other advisory bodies such as ICES. In all cases the predictive accuracy which can be attained is low in relation to the demand for accuracy by the present management system.

The clients of fisheries science must recognize that large fluctuations in calculated catches at a particular target level of fishing mortality, e.g. $F_{0.1}$, will continue to occur. The solution lies in devising ways to deal with these fluctuations through the management planning process. The recent move towards multi-year fisheries management plans is a step in the right direction. Managers must, however, be prepared to adjust such plans if there is evidence that

current levels of fishing will thwart the achievement of long-term objectives.

Managers must be sensitive to a variety of interests while also searching for workable solutions to complex problems. The manager deals in a very practical world and is likely to question theoretical or general solutions, recognizing that they are less likely to be useful than highly specific, realistic ones. But, more importantly, managers are faced with uncertainty on a daily basis and frequently turn to fisheries scientists seeking certainty. Increasingly, scientists realize that they cannot provide that certainty.

In Canada, scientific advice has long been couched in terms of a specific projection of the likely response of fish stocks to a particular level of exploitation. Although scientists have realized for some time that there are large margins of error surrounding their estimates of stock abundance, fishing mortality and other vital parameters, they have been reluctant until recently to offer advice which makes explicit the tremendous uncertainty surrounding these estimates. That reluctance, particularly in Atlantic Canada, was grounded in the experience of the international commissions. When international fisheries managers were offered a range of management options and the likely implications of those options, they inevitably chose the option allowing the highest catch possible in the short term.

In the system which evolved following extended jurisdiction, Canadian scientists and managers agreed that biological advice would be offered for Atlantic finfish stocks as one number, corresponding to the catch at a particular target fishing mortality, F_{01}. This became the standard practice. The tendering of advice in the form of one specific number created an atmosphere of certainty, even though the scientists involved were fully aware that the margin of error could be considerable. However, a margin of error around F_{01}

gave more comfort (at least to the scientists) than a similar margin around F_{max}. As the data bases gradually improved in the decade after extended jurisdiction, it became clear that early estimates of stock abundance were often wide of the mark by a considerable margin, the tendency being to overestimate stock abundance. If the management objective had been F_{max} the consequences could have been catastrophic. Thus, $F_{0.1}$ worked.

But the Atlantic fishing industry was jolted when the full extent of the uncertainties involved was revealed by the dramatic reassessment of the major northern cod stock in January 1989. The uncertainties involved in the northern cod assessment were not unique. Similar instances of radical revision of scientific advice had occurred in the case of several major northeast Atlantic stocks. The irony is that in the latter instances ICES advice had been offered in the form of a range of options for many years, with managers generally choosing "Status Quo" TACs.

Recently (September, 1990), the NAFO Scientific Council convened a Special Session on Management under Uncertainty (NAFO 1990). This brought together scientists from Canada, Denmark (Greenland), the EEC, Japan, New Zealand, the USA and the USSR. This session concluded that almost everything that concerns the provision of management advice is uncertain to a greater or lesser extent, and the effect of those uncertainties on management advice is quite variable.

Analyses presented at this Session indicated that traditional (constant mortality or constant escapement) policies may not be optimal when judged by objective criteria. However, constant low fishing mortality strategies may be close to optimal under a wide range of conditions, so that the $F_{0.1}$ rule of thumb for quota setting is often an appropriate choice in practice.

The NAFO Scientific Council Session focused on how uncertainties of various sorts in assessments could best be

portrayed for fisheries managers. One approach suggested would summarize the effects of these uncertainties in terms of risk, i.e. the probability of "something nasty" happening. It was suggested "something nasty" be defined in terms of something immediately comprehensible to managers and the fishing industry, e.g. economic loss, numbers of boats forced out of operation or some other relevant factor. The presentation of advice to managers should display the results for a range of risk levels, and not prejudge what level of risk would be acceptable.

Placing confidence limits around the advice would also emphasize, for managers, the extent of uncertainty involved. Whether this would lead to management options being selected from the upper bound of the confidence interval remains to be seen. The desire to maximize short-term catch would probably lead initially to some risk-prone decisions, particularly if the stock in question appeared to be robust.

It was concluded that the most serious uncertainties in practice may be those due to model mis-specifications, errors in basic catch data (especially misreporting) and uncertainty about the stock-recruitment relationship. The Session also concluded that, according to various criteria, compound management strategies which interpolate between classical strategies (F_{max}, $F_{0.1}$) and "status quo" management are superior and yield lower variability of catch and effort. It was proposed that such strategies be seriously considered by managers especially when current F values are far from the long-term target level. In effect, this is the approach that Canada has been pursuing in recent years with the so-called "50% rule" for adjustment of Atlantic groundfish TACs.

While explicit recognition of the degree of uncertainty associated with scientific assessments and advice is likely to be useful, the bottom line is that managers must be prepared to take decisions on fisheries management issues in the

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While explicit recognition of the degree of uncertainty associated with scientific assessments and advice is likely to be useful, the bottom line is that managers must be prepared to take decisions on fisheries management issues in the

absence of certainty. It is a fallacy to think that effective management can only occur where there is complete and accurate scientific understanding of the fishery being managed. It is a mistake to think that fisheries science can ever specify exactly the implications of a particular management strategy. It is also a mistake to delay management action pending the acquisition of more precise or more accurate scientific knowledge.

The reality is that managers must act in an atmosphere of uncertainty. Honest mistakes will be made. Fisheries resources are generally sufficiently resilient that corrections or adjustments can be made in time to avert catastrophe. This is not always the case; sometimes resources can be reduced to economic extinction. The failure to take corrective action in such cases results not so much from uncertainty as from paralysis in the decision-making process, often because of the tug-of-war between conflicting objectives.

4.5.2 The Need For Greater Interdisciplinary Collaboration

There is a broader dimension to the scientific challenge. Fisheries systems are exceedingly complex, characterized by interactions among the biological, environmental, economic, social and regulatory dimensions. To meet the challenge of understanding even some of these interactions will require much more effective interdisciplinary collaboration than has been the practice in the past.

Even fisheries biology which has provided the scientific basis for fisheries management for most of the past century can no longer be studied in isolation. It has become increasingly apparent that variability in the physical environment can have a profound effect on year-class success as well as migration and availability patterns of fish stocks to fishermen in particular areas and seasons. The relative impact of parental stock size and environmental variability

upon recruitment success remains to be determined. It is likely that the influence of the various factors differs among species and among fish populations. The need for integrated biological and physical oceanographic studies is now recognized as a priority (see Chapter 6, section 2). Interdisciplinary collaboration in the natural sciences is being harnessed more effectively than in the past to tackle questions of fundamental importance to future advances in fisheries management.

The track record in bridging the gap between the natural and social sciences, and within the social sciences, is less impressive (see Parsons, In Press).

There is a need to forge new linkages among biologists, economists and other social scientists to bring together the combined efforts of the natural and social sciences to provide for more effective scientific input to the fisheries management process. Biologists, economists and other social scientists all have a role to play in determining the "best use" of fisheries resources, i.e., in defining the Optimum Sustainable Yield. Ultimately the decisions will be made at the political level but there is a need to array for decision makers the implications of alternative management options. Those options have biological, economic, and social dimensions. Currently, the economic and social implications are ill defined in the fisheries management planning process.

For too long "fisheries science" has been regarded as synonymous with "fisheries biology." This reflects the dominant role fisheries biology has played as the scientific basis for fisheries management (Wooster, 1988). It is time to change that perspective. Physical oceanography, fisheries economics, sociology and social anthropology must also be part of a truly integrated approach to fisheries science. As we move toward the next century, we must also move toward an integrated bio-socio-economic approach to fisheries science as the scientific input to fisheries management. This will not

be achieved overnight or without difficulty. It will require a recognition by fisheries biologists that the other scientific disciplines have a legitimate role. It will also require a strengthening of the capability for social scientific research on fisheries in Canada. Although this may be difficult, it is essential if we are to make progress on improving the scientific basis for fisheries management in the next century.

5. The Experience Of Other Countries

While an examination of the relative success of fisheries management approaches in other countries is beyond the scope of this thesis, it is worth noting that the Canadian experience is by no means unique. Miles (1989) reported the results of a 1985 workshop on the Management of World Fisheries: Implications of Extended Coastal State Jurisdiction. This looked at the early post-extension experience in various parts of the world. The various case studies presented at this workshop indicated that the impact of extended jurisdiction varied significantly among countries and among different regions of the world and hence it was difficult to draw any overall conclusions.

While many coastal states clearly received some benefits from the new 200-mile zones, Miles (1989) concluded that the case studies generally illustrated five kinds of management failures on the part of coastal states:

1. failures in conservation;
2. failures in avoiding basic allocation decisions and, as a consequence;
3. failures in dealing with the problems of overcapitalization;
4. failures, on the part of developing countries, in putting in place adequate management systems because they lack the capability and resources to do so; and

5. failures in fisheries development (either uncompleted or inappropriate development).

Miles also concluded that there is no necessary connection between extended jurisdiction and the substance of fisheries management in terms of actual performance. Extended jurisdiction only provided an opportunity to increase control over all fishing both foreign and domestic. How coastal states exercised that control differed significantly from one country to another.

More recently (Parsons, In Press) I undertook a comparison of the fisheries management experience in several developed fishing countries post-extension. From this I concluded that two fundamental problems - overfishing and overcapacity - continue to confront fisheries managers in most of the countries examined (the EEC, Norway, Iceland, the United States, Australia and New Zealand). As examples, Norway has experienced major resource problems in the Barents Sea and the EEC has reduced many of its fish stocks to levels where the maintenance of an adequate spawning stock has become a major concern. Most countries continue to grapple with the problem of excessive fishing capacity.

Anthony (1990) provided a recent review of the management of a fishery close to home, the New England groundfish fishery in the first 10 years under the Magnuson Fishery and Management Conservation Act. He evaluated the state of the New England groundfish fisheries in the post-extension era from five perspectives:

1. the condition of the resource;
2. benefits to fishermen in terms of catches and dollars;
3. benefits to processors;
4. benefits to consumers; and
5. the effectiveness of management in achieving these benefits.

Following a short-term recovery of some stocks immediately following extension, the abundance of the principal groundfish stocks declined dramatically by 65% from 1977 to 1987. Fishing mortality on many stocks reached record levels, generally doubling from 1977 to 1986. The decline in abundance was reflected in a dramatic decline in the catch per unit of effort by otter trawlers after 1988, in the range of 50-60%. The gross revenue per vessel also declined steadily from 1978 to 1985.

Overall, Anthony (1990) concluded:

> "The effective (real) fishing effort in 1987 was, in fact, more than twice as great as it was in 1977 because of the increase in both size and number of vessels and the improvements in fishing technology. This is the problem that the New England Fishery Management Council has had to face during the last decade. The Council did not anticipate this great increase in fishing power and apparently failed to recognize its significance. The control of such increases in fishing potential with indirect control measures, such as mesh sizes, minimum fish sizes and spawning closures, simply was insufficient. In the case of New England groundfish, therefore, the MCFMA did not result in successful management during its first decade of implementation."

The New England experience is perhaps but an extreme example of the failure of most countries to take effective action to utilize the fisheries management opportunities created by the new 200-mile zones. The problems of tne pre-extension period have continued, in many instances unaltered, into the post-extension era. For a fuller discussion, see Parsons (In Press).

6. CONCLUSION

Despite the opportunities offered by extension of fisheries jurisdiction to 200 miles, Canada's fishing industry

continued to experience recurrent crises in the post-extension era. The various crises were triggered by different combinations of factors. But the root cause was the continuing inability of the fishing industry to weather downturns.

The multiple conflicting objectives of fisheries management have contributed to this vulnerability. While conservation objectives have generally been met in the post-extension era, Canada has been less successful in meeting economic objectives. Excess capacity continues to be a problem in many marine fisheries because of the common property nature of fisheries resources. Limited entry has only been a partially successful management tool for dealing with the common property problem. Individual quotas were tried in many fisheries during the 1980s. They appear to be a promising tool but are likely to work best only in fisheries with very specific characteristics.

Social factors have played as large a role in shaping fisheries management policy and practice post-extension as they did prior to extension. Many hundreds of coastal communities continue to rely heavily on the fisheries as the primary source of employment and income. There is a chronic dependence upon the fisheries as the employer of last resort and the ticket of entry to the unemployment insurance social safety net. The result is too many fishermen chasing too few fish.

The problems of the marine fisheries continue to pose a fisheries management dilemma. The results have been a recurrent boom-and-bust pattern and recurrent demands for government financial assistance. But the provision of such assistance has not resolved the fisheries management dilemma. Throwing money at the problem has not made it disappear.

Fisheries management is characterized by conflict and uncertainty. Conflict among various sectors of the fishing industry is all-pervasive. Scientific uncertainty about the

probable outcome of alternative management interventions could lead to paralysis. Yet fisheries managers must act despite conflicting objectives and in the face of the considerable uncertainty. Awaiting consensus and certainty are not viable options.

The 200-mile fisheries zone, whatever benefits it may have provided, has not removed the underlying uncertainty and instability. Managers and the fishing industry must recognize that some degree of instability will continue to be a fundamental characteristic of Canada's marine fisheries.

CHAPTER VIII

CONCLUSIONS

The worldwide move to 200-mile exclusive economic/fishing zones in the 1970s was probably the most significant event in world fisheries history. This enclosure of a large part of the global oceans commons brought under coastal state jurisdiction valuable fish resources. Even though the 1982 Law of the Sea Convention has not yet come into force, the 200-mile exclusive economic zone is now accepted as customary international law.

Canadian proponents of expanded coastal state jurisdiction over resources adjacent to the Canadian coast hoped that the 200-mile zone would provide the means to halt the overfishing of resources outside the existing territorial sea, with concomitant benefits flowing to the coastal state. While not all resources of interest to Canada were encompassed within its new 200-mile zone, expectations were high that the 200-mile fisheries zone would provide the basis for prosperous and expanded fisheries.

The 200-mile fisheries zone did provide benefits to Canada. Utilizing its increased management authority over a vast area and major fish resources, Canada established conservative Total Allowable Catches with the aim of bringing about rapid stock rebuilding. The major Atlantic groundfish resources recovered fairly rapidly from the low levels prevailing in the early 1970s. Catch rates of Canadian fishermen improved significantly. Within a very short time, foreign vessels were displaced from fisheries of interest to Canadian fishermen. Canadian fisheries were developed in areas and for species not previously utilized by Canada.

But these benefits were threatened by a push from many sectors to expand the Canadian harvesting and processing capacity to capitalize on the opportunities provided by the 200-mile zone. Scientific analyses at the time indicated that the existing fleet required more fish in order to be economically viable. Existing onshore processing facilities were operating at less than capacity.

The federal government largely held the line on growth of offshore harvesting capacity, despite vigorous pressure from the provinces and several large companies for expansion. It was less successful in constraining harvesting capacity of the inshore fleet. It gave priority to restoring the fortunes of this sector. As a consequence, it did not begin to control the capacity of the inshore fleet until 1980. The controls introduced at that time did not succeed in arresting the growth in capacity.

Onshore processing capacity increased substantially in the late 1970s, fuelled by the euphoria surrounding the 200-mile zone and funded through borrowing. While the major push came from certain provinces and large vertically integrated companies, the federal government was not blameless. Certain of its programs assisted the build-up of onshore capacity.

A major crisis in the Atlantic groundfish industry in the early 1980s was alleviated when the federal government invested approximately $300 million to restructure the large vertically integrated companies from five into two. This did not, however, result in any significant reduction in harvesting and processing capacity.

A major market upsurge in the mid-late 1980s led to another increase in onshore processing capacity. It also masked a levelling off in the resource overall and a downturn in some stocks. The period from 1985-1988 was one of the most prosperous in the history of Canada's marine fisheries. On the Atlantic coast this bubble burst when scientists advised in January 1989 that they had overestimated the size and rate

of rebuilding of the major northern cod resource. A major overcapacity problem in southwest Nova Scotia also became more evident with the downturn in certain stocks on the Scotian Shelf. Thus in 1989 and 1990 the Atlantic groundfish industry again faced crisis. Following various studies, the federal government responded with the Atlantic Fisheries Adjustment Program. The government committed $597 million over five years to bolster scientific research, to increase enforcement capacity, to assist workers displaced by plant closure, and to support the development of alternative industries in one-industry fishing communities whose survival was threatened by plant closures.

These crises demonstrated dramatically that the 200-mile zone had not resolved the underlying problems of Canada's marine fisheries. These problems have their roots in what I have termed the fisheries management dilemma. Certain characteristics of this dilemma were examined in the previous chapter.

While it is true that there has been a recurrent boom-and- bust syndrome and recurrent crises, the extent varies among fisheries. Some fisheries have enjoyed prolonged periods of significant prosperity, yielding good economic returns to participants. Many of the shellfish fisheries, for example, have withstood the periodic downturns which have plagued the Atlantic groundfish fishery. But even the shellfish fisheries are subject to variability. The virtual collapse of the Gulf snow crab fishery in the late 1980s contrasts with the dramatic surge in Atlantic lobster catches through the 1980s. The Pacific salmon fishery, which harvests a variable resource, experienced a prolonged period of prosperity in the mid to late 1980s but faced uncertain market conditions at the beginning of the 1990s. Even within the Atlantic groundfish fishery, there are enormous differences between the relative prosperity of midshore dragger fishermen in southwest Nova Scotia and the relative poverty of small-

boat inshore fishermen in eastern and northern Newfoundland and Labrador.

It is impossible to devise a uniform set of fisheries objectives and management measures which fit all the circumstances of Canada's marine fisheries. There is as much difference among the different fisheries of Atlantic Canada as there is between the Atlantic and Pacific fisheries. What is required is a national framework of fisheries management objectives and policies which can be tailored to the specific circumstances of particular regions and fisheries. Fisheries management initiatives must respond to local circumstances and local priorities without violating national precepts and standards. As an example of such national standards, it is generally agreed that priority in resource allocation is to be accorded to resource conservation, native food fisheries, and communities adjacent to the resource. Economic viability will be the dominant objective for certain fisheries, and social objectives will predominate in other areas. Where fish resources are being threatened by habitat deterioration or overfishing, resource conservation will be the dominant concern. In other instances, emphasis on resource restoration will be necessary.

Significant changes in Canada's marine fisheries will occur over the next several decades. Although not directly related to the topic of this dissertation, aquaculture will become increasingly important as we enter the 21st century. There will be increasing competition between aquaculture enterprises and harvesters of wild fish resources. There is already conflict between aquaculture operators and other users of nearshore habitat. This may intensify. While aquaculture will undoubtedly comprise a greater share of the value obtained from Canada's fisheries resources, it is unlikely that it will displace the predominant role of the wild fisheries in the foreseeable future.

It is likely that the use of individual quotas as a fisheries management tool will spread to many other fisheries by the beginning of the next century. Transferable quotas will probably be introduced in a greater number of these fisheries. This offers promise of reducing the common property tendency to overinvest in excess capacity. But, because individual quotas are not suited to all fisheries, more traditional methods will continue to be employed as well.

Whatever the shape of these changes, the essential fisheries management dilemma will remain. The combination of natural resource variability, fluctuations in market demand, the common property nature of the resource leading to excess capacity, and the continued dependence on the fishery in isolated coastal communities with few alternative employment opportunities, will likely result in a repetition of the boom-and-bust pattern and recurrent crises. Governments will continue to be called upon to provide assistance during these times of crisis.

Change in the institutions and mechanisms of fisheries management seems imminent. It appears that there will a move to distance the Minister from micro-level decision-making which will probably be handled by semi-autonomous boards or agencies (DFO 1991b).

The past three decades were a period of dynamic change in marine fisheries management. The next several decades will undoubtedly also be a period of considerable change and challenge. Change will occur as the result of factors which can only be dimly perceived today. The challenge will be: (1) to ensure sustainable fisheries; (2) to foster a more resilient industry better able to withstand the inevitable downturns; and (3) to lessen dependence on the fishery in the coastal regions of Canada, particularly parts of Atlantic Canada.

These three elements of challenge are interrelated. Sustainability of the resource base is achievable unless

global change, e.g. global warming, occurs at a pace and in a manner as yet unforeseen. Assuming that market demand for fishery products will increase, rather than lessen, this means that fisheries can be sustained. This does not, however, mean maintaining the fisheries as they exist today.

In order to foster a more resilient industry, it is essential that steps be taken to address the problem of excess capacity (both labour and capital). In areas where alternative economic opportunities exist, this may be achieved, at least partially and in some fisheries, through the more widespread adoption of individual transferable quotas. For other fisheries, industry - funded buy-backs of excess capacity may become an option linked to individual quotas. In other fisheries, this may mean more rigorous enforcement of existing or improved limited entry licensing (e.g. terminal licences) and fleet capacity controls, with a gradual reduction in capacity over time. Because of the diversity of Canada's fisheries, no one solution will suit all circumstances.

The creation of a more resilient fishing industry cannot be achieved through fisheries management initiatives alone. It will be necessary to harness the collective policy instruments of governments, both federal and provincial. The creation of a resilient fishing industry in parts of Atlantic Canada, for example, Newfoundland and Labrador, will mean fewer people employed in the harvesting sector. This will only be achievable if alternative employment opportunities become available. This in turn is dependent upon diversification of the economy in those coastal regions.

Thus, fisheries policy is inextricably linked to regional economic development policy. In the past, for example, in the post-extension era, it was thought that the fishery would generate additional employment opportunities as Canada moved to exploit the resources of its new zone. Regional development programs helped fund the expansion in onshore

processing capacity which contributed to the Atlantic fisheries crisis of the early 1980s.

Now the shoe is on the other foot. Economic diversification is required in order to provide alternative employment opportunities for those now engaged in the fisheries. There have been numerous attempts to diversify the Atlantic economy over the past several decades. Regrettably, most have failed.

Should present and future attempts to diversify the Atlantic economy also fail, it is likely that the fisheries will continue to be called upon as the employer of last resort. Continued reliance on the fisheries to fill this role will hinder the achievement of conservation and economic viability objectives. In the absence of alternative economic opportunities, it will be difficult to create a resilient fishing industry able to prosper in good times and survive without government handouts in bad times.

This poses an enormous conundrum for all involved with fisheries and regional development policy. Unless the fishing industry becomes more resilient, it will continue to lurch from crisis to crisis, riding the roller coaster of boom and bust. Fishermen and fish processors alike will continue to call on governments to help them through the downturns and the fisheries will continue to be the ticket of entry to social support programs.

If this prognosis is correct, the considerable promise inherent in Canada's extension of fisheries jurisdiction to 200 miles will remain unfulfilled. The bottom line is that the 200-mile zone produced significant benefits but was not a panacea for the problems of Canada's marine fisheries.

APPENDIX I

Articles 61 and 62 of the Law of the Sea Convention (1982). 1983 United Nations.

Article 61, dealing with the conservation of the living resources, provides that:

"1. The coastal State shall determine the allowable catch of the living resources in its exclusive economic zone.

"2. The coastal State, taking into account the best scientific evidence available to it, shall ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zones is not endangered by over-exploitation. As appropriate, the coastal State and competent international organizations, whether subregional, regional or global, shall co-operate to this end.

"3. Such measures shall also be designed to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors, including the economic needs of coastal fishing communities and the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global.

"4. In taking such measures the coastal State shall take into consideration the effects on species associated with or

dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened.

"5. Available scientific information, catch and fishing effort statistics and other data relevant to the conservation of fish stocks shall be contibuted and exchanged on a regular basis through competent international organizations, whether subregional, regional or global, where appropriate and with participation by all States concerned including States whose nationals are allowed to fish in the exclusive economic zone."

Article 62, dealing with the utilization of the living resources, provides that:

"1. The coastal State shall promote the objective of optimum utilization of the living resources in the exclusive economic zone without prejudice to Article 61.

"2. The coastal State shall determine its capacity to harvest the living resources of the exclusive economic zone. Where the coastal State does not have the capacity to harvest the entire allowable catch, it shall, through agreements or other arrangements and pursuant to the terms, conditions, laws and regulations referred to in paragraph 4, give other States access to the surplus of the allowable catch, having particular regard to the provisions of articles 69 and 70, especially in relation to the developing States mentioned therein.

"3. In giving access to other States to its exclusive economic zone under this article, the coastal State shall

take into account all relevant factors, including, inter alia, the significance of the living resources of the area to the economy of the coastal State concerned and its other national interests, the provisions of articles 69 and 70, the requirements of developing States in the subregion or region in harvesting part of the surplus and the need to minimize economic dislocation in States whose nationals have habitually fished in the zone or which have made substantial efforts in research and identification of stocks.

"4. Nationals of other States fishing in the exclusive economic zone shall comply with the conservation measures and with the other terms and conditions established in the laws and regulations of the coastal State. These laws and regulations shall be consistent with this convention and may relate, inter alia, to the following:

(a) licensing of fishermen, fishing vessels and equipment, including payment of fees and other forms of remuneration, which, in the case of developing coastal States, may consist of adequate compensation in the field of financing, equipment and technology relating to the fishing industry;

(b) determining the species which may be caught, and fixing quotas of catch, whether in relation to particular stocks or groups of stocks or catch per vessel over a period of time or to the catch by nationals of any State during a specified period;

(c) regulating seasons and areas of fishing, the types, size and amount of gear, and the types, sizes and numbers of fishing vessels that may be used;

(d) fixing the age and size of fish and other species that may be caught;

(e) specifying information required of fishing vessels, including catch and effort statistics and vessel position reports;

(f) requiring, under the authorization and control of the coastal State, the conduct of specified fisheries research programmes and regulating the conduct of such research, including the samples of catches, disposition of samples and reporting of associated scientific data;

(g) the placing of observers or trainees on board such vessels by the coastal State;

(h) the landing of all or any part of the catch by such vessels in the ports of the coastal State;

(i) terms and conditions relating to joint ventures or other co-operative arrangements;

(j) requirements for the training of personnel and the transfer of fisheries technology, including enhancement of the coastal State's capability of undertaking fisheries research; and

(k) enforcement procedures.

"5. Coastal States shall give due notice of conservation and management laws and regulations."

APPENDIX II

LIST OF ACRONYMS

ACFM	Advisory Committee On Fisheries Management
ADM	Assistant Deputy Minister
AFAP	Atlantic Fisheries Adjustment Program
AGAC	Atlantic Groundfish Advisory Committee
AHMC	Atlantic Herring Management Committee
ARC	Atlantic Regional Council
BNS	Bank of Nova Scotia
CAFSAC	Canadian Atlantic Fisheries Scientific Advisory Committee
CBR	Committee On Biology And Research
CEP	Chile, Ecuador and Peru
CFPA	Coastal Fisheries Protection Act
CPUE	Catch Per Unit Of Effort
CRC	Consolidated Regulations of Canada
DFO	Department of Fisheries and Oceans
DG	Director General
DND	Department of National Defence
DOE	Department of the Environment
DREE	Department of Regional Economic Expansion
EA	Enterprise Allocation
EC	European Community
EEC	European Economic Community
EEZ	Exclusive Economic Zone
f	Fishing Effort
F	Instantaneous Rate of Fishing Mortality
$F_{0.1}$	The instantaneous rate of fishing mortality (calculated from a yield-per-recruit curve) at which a unit increase in fishing effort (proportional to fishing mortality) will give an increase in yield 1/10th that of a unit of effort on the virgin stock (dynamic pool model)
FAO	Food and Agricultural Organization of the United Nations
FCC	Fisheries Council of Canada
FLASH	Foreign Licensing and Surveillance Hierarchical Information System
F_{max}	The instantaneous rate of fishing mortality which maximizes the yield-per-recruit (dynamic pool model)
FPAFC	Federal-Provincial Atlantic Fisheries Committee
FPI	Fishery Products International
FPSB	Fisheries Prices Support Board
FRG	Federal Republic Germany
GPP	Gross Provincial Product
HBN	H. B. Nickerson and Sons Ltd

IAS	Industrial Adjustment Service
IBSFC	International Baltic Sea Fisheries Commission
ICES	International Council for the Exploration of the Sea
ICJ	International Court of Justice
ICNAF	International Commission For The Northwest Atlantic Fisheries
INPFC	International North Pacific Fisheries Commission
IPHC	International Pacific Halibut Commission
IPSFC	International Pacific Salmon Fisheries Commission
IQ	Individual Quota
ISNT	Informal Single Negotiating Text
ITQ	Individual Transferable Quotas
LOS	Law Of The Sea
LTA	Long Term Agreement
MAC	Ministerial Advisory Council
MCS	Monitoring, Control and Surveillance
MEL	Marine Ecology Laboratory
MEY	Maximum Economic Yield
MSY	Maximum Sustainable Yield
NAFO	Northwest Atlantic Fisheries Organization
NASCO	North Atlantic Salmon Conservation Organization
NEAFC	Northeast Atlantic Fisheries Commission
NFFAWU	Newfoundland Fishermen, Food and Allied Workers Union
NSP	National Sea Products
OGAC	Offshore Groundfish Advisory Committee
OPEC	Organization of Petroleum Exporting Countries
PARC	Pacific Regional Council
PSARC	Pacific Stock Assessment Review Committee
RSC	Revised Statutes Of Canada
RSPP	Resource-Short Plant Program
SOFA	Save Our Fisheries Association
SSIP	Scotian Shelf Ichthyoplankton Program
STACRES	Standing Committee on Research and Statistics, ICNAF
t	Metric ton
TACs	Total Allowable Catches
TAP	Temporary Assistance Program
TFAF	Task Force on Atlantic Fisheries
UFAWU	United Fishermen and Allied Workers Union
UI	Unemployment Insurance
UNCLOS	United Nations Law of Sea Conference
UNEP	United Nations Environment Program

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