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Technical Report No. 18
**The Public Regulation of
Commercial Fisheries in Canada**

Case Study No. 3

The Northern Cod Fishery of Newfoundland

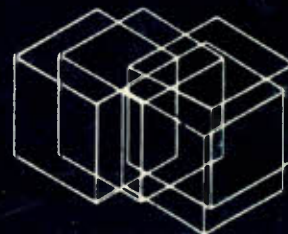
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TECHNICAL REPORT NO. 18

THE PUBLIC REGULATION OF
COMMERCIAL FISHERIES IN CANADA

Case Study No. 3

THE NORTHERN COD FISHERY OF NEWFOUNDLAND

by

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The findings of this Technical Report are the personal responsibility of the author, and, as such, have not been endorsed by members of the Economic Council of Canada.

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Table of Contents

| | <u>Page</u> |
|---|-------------|
| Résumé. | iii |
| Summary | vii |
| 1. Introduction | 1 |
| 2. Biological Aspects of the Resource | 13 |
| 3. The Industry | 17 |
| (a) Primary Sector | 17 |
| (b) Secondary Sector | 24 |
| 4. A Brief History of the Regulation of the Northern Cod Fishery Prior to 1977 | 29 |
| (a) Inshore Sector | 29 |
| (b) Offshore Sector | 35 |
| 5. Current and Future Management of the Resource | 41 |
| 6. Conclusions | 63 |
| Footnotes | 67 |
| References | 71 |

List of Tables

| | |
|-------------------|----|
| Table 1 | 2 |
| Table 2 | 7 |
| Table 3 | 24 |
| Table 4 | 33 |
| Table 5 | 37 |
| Table 6 | 43 |
| Table 7 | 52 |

List of Figures

| | |
|--------------------|----|
| Figure 1 | 15 |
| Figure 2 | 18 |

RÉSUMÉ

Les stocks de morues du Nord occupent une zone qui s'étend du sud du Labrador jusqu'au sud-est de Terre-Neuve. C'est la ressource la plus considérable dont dispose l'industrie de la pêche de Terre-Neuve et, aux yeux du gouvernement, elle est de toute première importance pour l'ensemble de la province.

La pêche à la morue du Nord se pratique dans deux secteurs -- le hauturier et le côtier -- qui sont assez bien délimités. Avant l'extension, par le Canada, de sa juridiction sur les pêches, la pêche hauturière échappait entièrement à son contrôle. Elle relevait de la Commission internationale des pêches du nord-ouest de l'Atlantique (ICNAF). Ceux qui la pratiquaient venaient surtout de pays éloignés; la participation canadienne était minimale.

Par contre, le Canada avait pleine compétence en matière de pêche côtière qui, par définition, était limitée à la province de Terre-Neuve. Même si les deux secteurs relevaient de deux organismes de réglementation distincts, il n'y avait conflit sur aucune critère de gestion. Le Canada et l'ICNAF s'entendaient sur le fait que la norme à appliquer était celle du rendement maximum soutenable (RMS).

Comme il était impossible que la pêche côtière puisse réduire la biomasse à un niveau inférieur au RMS, l'accès illimité à ce secteur était donc permis. Au début des années 70, cependant, le gouvernement fédéral a commencé à contester la sagesse économique d'une telle politique, mais rien de concret n'a été fait avant l'extension, par le Canada, de sa juridiction sur les pêches.

Vers la fin des années 50, l'ICNAF a permis au secteur hauturier de s'étendre considérablement. Or, cette expansion a eu un effet dévastateur sur la pêche côtière, de sorte que vers le milieu des années 70, celle-ci n'était plus qu'un pâle reflet de ce qu'elle avait été vingt ans plus tôt. Voilà une des raisons pour lesquelles le Canada a été amené à abandonner le principe du RMS.

Avec l'extension de la zone de pêche canadienne, les stocks de morues du Nord sont passés entièrement sous contrôle canadien. Et depuis, la politique des autorités a été de reconstituer ces ressources, en espérant grandement que cela contribuera au rétablissement du secteur côtier.

Sous le nouveau régime, la pêche hauturière, où prédomine actuellement une flotte canadienne, est soumise à un contrôle rigoureux et efficace. Il existe pourtant un point faible sur le plan de la gestion : les compagnies canadiennes rivalisent entre elles pour obtenir leur part du quota global attribué à ce

secteur. Il en résulte un gaspillage économique pour les raisons habituelles. Nous examinons ici la possibilité de recourir à un système de quotas individuels des prises et nous concluons que, sur le plan technique, la chose est faisable. Mais une telle initiative serait probablement entravée par la rivalité qui existe entre la Nouvelle-Écosse et Terre-Neuve et par le vif désir de cette dernière province de minimiser la participation de sa voisine à la pêche hauturière.

Le secteur de la pêche côtière, au contraire, n'est efficacement réglementé que depuis 1980, et ce n'est qu'après 1975 qu'il a commencé à se rétablir des dommages subis antérieurement. Comme il n'existait pratiquement pas de barrières à l'accès à ce genre de pêche, le nombre des pêcheurs s'était accru d'une façon exponentielle pendant plusieurs années. Devant cette situation qui semblait échapper à tout contrôle, les autorités ont décrété, vers le milieu de 1980, un arrêt général de cette progression et appliqué par la suite un régime efficace de permis.

En vertu du nouveau système, les pêcheurs côtiers sont répartis en deux catégories, ceux à plein temps et ceux à temps partiel. Environ les deux tiers des pêcheurs côtiers de Terre-Neuve ont été classés dans la deuxième catégorie. Bien que les autorités fédérales insistent sur le fait qu'aucun pêcheur à temps partiel ne doit être mis à pied, nous soutenons, de notre côté, que le

nombre de pêcheurs à temps partiel diminuera en fait régulièrement à la longue par voie d'attrition.

Nous examinons aussi la question de la possibilité d'établir des quotas individuels de prises dans le secteur côtier; nous concluons par des doutes sérieux sur cette mesure possible.

SUMMARY

Northern cod is a complex of cod stocks which extends from southern Labrador to southeastern Newfoundland. It is the single most important resource to the Newfoundland fishing industry and is, according to the Newfoundland government, of overwhelming significance to the province as a whole.

The fishery based upon the northern cod resource is sub-divided into reasonably distinct offshore and inshore segments. Prior to Extended Fisheries Jurisdiction (EFJ) the offshore fishery lay wholly outside of Canadian jurisdiction and was managed by the International Commission for the Northwest Atlantic Fisheries (ICNAF). Participants in the fishery were largely from distant water nations. Domestic participation was minimal.

The inshore fishery was, in contrast, wholly under Canadian control. By definition it was confined to the province of Newfoundland. Although the two segments of the fishery were subject to different regulatory bodies, there was no quarrel over management criteria. Both Canada and ICNAF were in agreement that the appropriate criterion was MSY.

Since it was not possible for the inshore sector to reduce biomass below the MSY level, a policy of unlimited entry to the sector was allowed. By the early 1970s, the federal government began to worry about the economic wisdom of such a policy, but nothing effective was done prior to EFJ.

The offshore sector was permitted by ICNAF to expand dramatically in the late 1950s. This expansion had a devastating impact on the inshore sector so that by the mid-1970s the inshore fishery was but a pale shadow of what it had been twenty years earlier. This experience was one of the factors which led Canada to abandon the MSY doctrine.

With the coming of EFJ, northern cod has come wholly under Canadian control. Since EFJ the policy of authorities has been to rebuild the resource with the restoration of the inshore sector being a much hoped for result.

Under the new regime, the offshore sector, which is now dominated by a domestic fleet, is subject to rigid and effective control. The one flaw in the management of the sector is that domestic companies compete with one another for shares of the global domestic offshore quota. This leads to economic waste for the usual reasons. We discuss the feasibility of using a system of individual harvest quotas as a corrective and conclude that technically such a system is feasible. The impediment to individual quotas is likely to arise from Newfoundland-Nova Scotia rivalry and the intense desire of St. John's to minimize Nova Scotian participation in the fishery.

In contrast the inshore sector was not subject to effective control before 1980. The inshore fishery began to recover after 1975. With barriers to entry virtually non-existent, the number of fishermen in the sector grew exponentially for several years. Then faced with a fishery that appeared to have run out of control, the authorities introduced a general freeze in mid-1980 and subsequently introduced an effective licencing program.

Under the new licencing system inshore fishermen are placed in full-time and part-time categories. Approximately two thirds of the inshore fishermen in Newfoundland have been designated part-time. While the federal authorities are insistent that no part-time fishermen will be ejected from the fishery, we argue that the part-time fisherman population will in fact steadily decline over time through attrition.

We address the question of the feasibility of individual harvest quotas in the inshore sector. We conclude that the feasibility of a system of individual quotas inshore is dubious at best.

1. Introduction

The cod stock, popularly known as "northern cod," is in fact a complex of stocks which extends from the waters off southern Labrador to those off the Avalon peninsula in southeastern Newfoundland. In a recent

multi-volume study on its province's fishing industry, the Newfoundland Department of Fisheries maintained that northern cod is and will continue to be the single most important stock to the Newfoundland fishing industry (Newfoundland and Labrador, Department of Fisheries (1978a, Executive Summary, 4)). The authors of the study might well have added that no other stock exploited by the province's fishing industry presents more difficult or complex problems of management and regulation.

In order to be able to grasp the nature of these problems, it is necessary to have a broad overview of the role which exploitation of the stock has played and is likely to play in the Newfoundland fishing industry's activities. This in turn requires that we both describe briefly the fishing industry as a whole and sketch the history of the exploitation of this stock over the preceding 25 years.

We shall in the introduction, then, present the requisite industry profile and general history of the stock's exploitation. Detailed discussions of the biological aspects of the stock and of the industry will be reserved for later parts of the case study.

The Newfoundland fishing industry is engaged primarily in the harvesting and processing of groundfish such as cod and flounder. Pelagic species and shellfish are harvested, but their contribution to the industry's output is relatively minor as is indicated by Table 1.

TABLE 1
Percentage Breakdown by Species of Average Value of
Landings in Newfoundland 1977-1978

| Species | Value of Landings as Percentage of Total |
|-------------------------|---|
| Groundfish: | |
| Cod | 40.2 |
| Flatfish ^(a) | 21.1 |
| Other Groundfish | <u>5.5</u> |
| Total Groundfish | 66.8 |
| Pelagic Species | 12.8 |
| Shellfish | 17.8 |
| Other ^(b) | <u>2.5</u> |
| Total | <u><u>100.0</u></u> |

(a) Includes flounder, halibut and turbot.

(b) e.g., cod livers, seals.

Source: Government of Canada, Fisheries and Oceans, Annual Statistical Review of Canadian Fisheries, 1978, Ottawa, 1980.

The harvesting sector of the industry is divided into reasonably distinct offshore and inshore segments.¹ The offshore fleet is made up largely of ocean going trawlers owned by the processing companies. The offshore operations are capital intensive and hence generate little employment. Of the 35,000 Newfoundland fishermen registered in 1980 no more than 1,200-1,300 were accounted for by fishermen in the offshore sector (Canada, Department of Fisheries and Oceans, St. John's).

The offshore fleet operates from warm water ports on an all year round basis, so that the vessels are confined largely to the south-eastern and southern parts of the island.

With respect to the groundfish species listed in Table 1, the offshore fleet has traditionally dominated the harvesting of flatfish (e.g. flounder). On the other hand, from the end of World War II up to the advent of Extended Fisheries Jurisdiction (E.F.J.) in 1977, the offshore fleet played only a modest role in the harvesting of cod, accounting for no more than 15 to 20 per cent of the harvest of this species. Indeed such cod as the offshore vessels did catch were almost entirely by-catch. (Munro (1980, Chapters 1 and 4)). Since E.F.J., however, a directed offshore cod fishery has grown. By 1980 the offshore sector accounted for one-third of Newfoundland's cod harvest (Canada, Department of Fisheries and Oceans, St. John's).

The inshore sector, in which are to be found the vast majority of Newfoundland fishermen, stands in sharp contrast to the offshore sector. It is characterized by highly labour intensive operations, low incomes, chronic unemployment, and geographical dispersion. The fishermen are scattered around the island in small communities, or outports, and along the southern coast of Labrador. The largest concentration of

inshore fishermen is to be found along the northeast and east coasts of the island (Munro (1980, Chapter 1)).

Another important characteristic of the sector, which differentiates it further from the offshore sector, is the fact that its activities tend to be highly seasonal. In some of the more northerly outports the fishing season lasts no longer than five months.

Furthermore, the degree of commitment of registered inshore fishermen is subject to wide variation. Some fishermen rely upon fishing as their primary source of income, while to others fishing is at most a secondary activity. The distinction between full time and part time fishermen proves to be central to much of the current discussion over limiting entry to the inshore sector.

It should be noted in passing that the seasonal nature of the inshore sector has serious implications for the processing sector. Fifty per cent of the output of the sector is accounted for by plants largely dependent upon the inshore sector (Newfoundland and Labrador, Department of Fisheries (1978a, Vol. 1B, 222)). Plants reliant upon the inshore sector may be shut down from four to seven months of the year (Newfoundland and Labrador, Department of Fisheries (1978a, Vol. 1A, 23)).

The inshore fishermen harvest many species, pelagic and shellfish, as well as groundfish. However, historically one species has dominated the inshore harvest. The species is cod. In the late 1970s, cod

accounted for approximately two-thirds of inshore harvests in terms of value (Munro (1980, Chapter 1)). Of the cod harvested by the inshore sector, over 60 per cent was taken from the northern cod stock complex (Newfoundland and Labrador, Department of Fisheries (1978, Vol. II)).

We are now in a position to qualify the statement by the Newfoundland Department of Fisheries on the importance of northern cod. While the stock may be the single most important one to the Newfoundland industry as a whole, it was until recently of only minor importance to the offshore sector. On the other hand, it has been central to the life of the inshore sector.

Finally there exists a so-called middle distance fleet of vessels lying between the standard inshore vessels and the standard offshore trawler. While these vessels are coming to figure more prominently in Newfoundland government planning, the fleet is as of yet very small. In 1979, for example, the middle distance fleet accounted for less than one per cent of the Newfoundland harvest of northern cod (NORDCO (1981, 169)).

With the broad overview of the industry complete, we now turn to a brief review of the history of the exploitation of northern cod over the past 25 years.

While there had not been a Canadian direct offshore fishery targeting northern cod between World War II and 1977, there had nonetheless been an extensive northern cod offshore fishery which had been prosecuted by distant water nations. Since Canada's fisheries jurisdiction in this region never exceeded 12 miles from shore during this period and since the offshore fishery took place well beyond 12 miles, Canada had no more than weak indirect control over the fishery.

What little control Canada did exert came as a consequence of her membership in an international regulatory commission established in 1949 known as the International Commission for the Northwest Atlantic Fisheries (ICNAF). As we shall see at a later point, ICNAF was, from Canada's point of view, largely ineffective in controlling the offshore exploitation of northern cod.

During the first decade after World War II, the offshore fishery was limited in scope, being confined largely to fleets from Spain, Portugal and France. These countries had long histories of fishing off Newfoundland's coasts. After 1955 the situation changed as a large expansion in offshore fishing activity throughout the northwest Atlantic occurred. Most of the expansion was attributable to distant water nations.

A rough measure of the increase in fishing activity is provided by the increase in tonnage of offshore vessels engaged in exploiting fisheries in the ICNAF area (Greenland to North Carolina). The tonnage increased from 500,000 tons in the late 1950s to 1,700,000 tons by the mid-1970s. (Canada, Department of the Environment, Fisheries and Marine Service (1976, 981)).

The effect of expanded foreign fishing effort upon the exploitation of northern cod is shown in Table 2.

TABLE 2

Harvests of Northern Cod: 1956-1980, Selected Years
('000s of tonnes)

| Year | Total Harvest | Newfound-land Inshore | Newfound-land Offshore | Maritimes and Quebec | Distant Water Nations | Percentage Breakdown of Harvest | | | |
|------|---------------|-----------------------|------------------------|----------------------|-----------------------|---------------------------------|------------------------|----------------------|-----------------------|
| | | | | | | Newfound-land Inshore | Newfound-land Offshore | Maritimes and Quebec | Distant Water Nations |
| 1956 | 300.5 | 172.1 | 2.3 | 8.7 | 117.4 | 57.3 | 0.7 | 2.9 | 39.1 |
| 1960 | 393.6 | 157.3 | 2.5 | 4.9 | 228.9 | 40.0 | 0.6 | 1.2 | 58.2 |
| 1964 | 562.0 | 131.5 | 6.7 | 3.3 | 420.5 | 23.4 | 1.2 | 0.6 | 74.8 |
| 1968 | 783.2 | 101.0 | 20.2 | 2.2 | 659.8 | 12.9 | 2.6 | 0.3 | 84.2 |
| 1972 | 454.6 | 62.3 | 3.8 | 0.4 | 388.1 | 13.7 | 0.8 | 0.1 | 85.4 |
| 1974 | 372.6 | 35.2 | 0.9 | - | 336.5 | 9.4 | 0.3 | - | 90.3 |
| 1975 | 287.5 | 41.2 | 0.9 | 0.6 | 245.0 | 14.3 | 0.3 | 0.2 | 85.2 |
| 1976 | 214.2 | 59.9 | 2.9 | 0.2 | 151.2 | 28.0 | 1.3 | 0.1 | 70.6 |
| 1977 | 172.7 | 72.7 | 6.1(a) | 0.7 | 93.2 | 42.1 | 3.5 | 0.4 | 54.0 |
| 1978 | 134.2 | 80.6 | 18.7(a) | 2.3 | 32.6 | 60.0 | 13.9 | 1.8 | 24.3 |
| 1979 | 166.7 | 86.7 | 42.9(a) | 8.4 | 28.7 | 52.0 | 25.7 | 5.0 | 17.3 |
| 1980 | N.A. | 94.2 | 47.2 | N.A. | N.A. | - | - | - | - |

(a) The distinction between Canadian offshore and distant water nation harvests in 1977, 1978 and 1979 was blurred by distant water nation harvests undertaken through co-operative arrangements with Canada.

Source: ICNAF, Statistical Bulletin; Economics Branch, Fisheries and Oceans Canada, St. John's.

While Canadian offshore harvests continued to be negligible, harvests of northern cod by distant water nation increased by over 460 per cent between the mid-1950s and the late 1960s. These nations' share of the total harvest increased from less than 40 per cent to between 85 and 90 per cent over the same period.

Total harvests of northern cod peaked in 1968 and declined steadily thereafter. Foreign fishing effort targetting the resource continued to expand, however, until the early 1970s.

The expansion in foreign fishing effort could be attributed largely to new entrants. The Soviet Union is an example. In the mid-1950s the Soviet Union took only a negligible share of the northern cod harvest. By the early 1970s, they accounted for between 35 and 40 per cent of the distant water nation harvests and almost one-third of the total harvest (ICNAF).

The impact of the expanded offshore fishery upon inshore harvesting of the resource was severe. Inshore catch rates fell dramatically. In response, the population of inshore fishermen reliant upon northern cod decreased. The inshore harvest declined in both absolute and relative terms between 1956 and 1974. Indeed in 1974 the inshore harvest was only slightly more than 20 per cent of the level enjoyed in the mid-1950s.²

By 1974 the entire groundfish industry on the Canadian Atlantic coast found itself in a deep crisis. Added to the effects of heavy foreign exploitation of the resources were falling prices for fish products due to the onset of a North American recession and rapidly rising

harvesting costs due to OPEC policies. Only prompt intervention by the federal government prevented widespread bankruptcies throughout the industry.

In response to the groundfish industry crisis in general and to the plight of Newfoundland inshore fishermen reliant upon northern cod in particular, the Canadian government demanded within ICNAF councils a forty per cent reduction in foreign fishing effort directed at groundfish in the ICNAF area. The Canadian demands were accepted at a special meeting of ICNAF held in September 1975.

The increase in the level of inshore harvests of northern cod after 1974, shown in Table 2, reflects in part the ICNAF and Canadian government's effort to reduce offshore exploitation of northern cod and to work towards a rebuilding of the resource. The policy of rebuilding or "investing" in the resource has been continued by Canada up to the present time.

The next major development came nine months after the special ICNAF meeting in the fall of 1975. In June, 1976, Canada announced its intention to extend unilaterally its fisheries jurisdiction to 200 miles from its shores. Extended Fisheries Jurisdiction (EFJ), made possible by the Third United Nations Law of the Sea Conference, was to come into effect on January 1, 1977.

The Canadian Exclusive Economic Zone (EEZ) which came into being with implementation of EFJ, encompassed virtually the entire northern cod stock complex. Thus, what had in large part been an international common property resource, became de facto, if not de jure, Canadian property.

One immediate consequence of Canada's acquisition of property rights over the resource has been a radical alteration of the nature of offshore fishery. Canadian fleets have been and are being encouraged to play a major role. Thus, whereas in 1974 Canadian vessels accounted for no more than 0.3 per cent of the offshore harvest, by 1979 their share of the offshore harvest had grown to 66 per cent (Canada, Fisheries and Oceans (1980a)).

The most important consequence of northern cod becoming Canadian property, of course, is that Canada has acquired along with the property rights full responsibility for the management of the resource.

Management policy at present is directed towards the continued rebuilding of the resource with a view to enhancing long run sustainable yields. It is projected, for example, that the total allowable catch (TAC) for northern cod by 1985 will exceed the 1978 harvest (see Table II) by 130 per cent (Canada, Department of Fisheries and Oceans (1981, 49)).

The professed goal of management is to achieve "optimum sustainable yield" (OSY), which is defined as that sustainable yield "allowing the greatest socio-economic benefit." (Department of Fisheries and Oceans, Canada (1981, 2)). Hence the rebuilding and maintaining the resource can be seen as no more than an initial step. Other policy measures must be implemented if the resource is to provide society with a stream of positive, let alone maximum, net benefits.

In order to be able to discuss and assess the other management issues which the federal government must now confront, it is necessary

to gain an understanding of the history of the management regimes to which the northern cod stock complex was subjected before EFJ. In particular, it is important to understand why these regimes produced such manifestly unsatisfactory results.

In order to gain this understanding in turn, we must first explore the underlying biology of the resource and enhance our knowledge of the Newfoundland industry exploiting the resource. It is to these topics that we now turn.

2. Biological Aspects of the Resource

As is true of all major cod stocks off Canada's Atlantic coast, the biology of the Northern cod has, because of its long-standing commercial importance, been extensively studied. While there are still important gaps in the biologists' knowledge of the resource, the resource is relatively well understood at least in comparison to many other fishery resources in Canada's Atlantic waters.

Cod is a moderately fast growing species. Along the Atlantic coast, cod recruits to fisheries, i.e., becomes harvestable, at age 3 to 4 years. Cod is susceptible to capture by a wide variety of gear. Trawls, gillnets, traps, longlines and jiggers are but a few of the gear employed in harvesting cod on the Atlantic coast.

Of the various biological characteristics of the resource, three deserve special comment. These are the stability of the resource, its spawning characteristics, and its inshore/offshore migration pattern.

The resource is such that catch per unit of fishing effort (CPUE) is roughly proportional to the size of the biomass. Thus as the resource is depleted CPUE declines steadily. This in turn serves to act as a brake upon commercial exploitation. Falling CPUE implies rising harvesting costs. Thus the resource is provided with important protection against irreversible damage through harvesting. As such cod can be compared with other demersal species and contrasted with clupeoids such as herring and anchovies.³

It is worth pointing out in passing that the 1974-1976 crisis in the Atlantic groundfish industry, as it pertained to northern cod, was very much a commercial, and not a biological, crisis. Biologists at that time debated, not whether northern cod was being threatened with

irreversible damage, but rather whether the stock had or had not been driven beyond the level associated with maximum sustainable yield (MSY).

Concomitant with the stability of the resource is its resiliency.

If the stock has been subject to extensive depletion, it rebuilds quite rapidly once the fishing pressure is reduced. The re-building of the northern cod stock has proceeded satisfactorily since 1975 (Munro (1980, Chapter 3)).

As a consequence of the stability and resilience of the resource, it is not in need of the strict, constant "on line" management required by highly vulnerable stocks such as salmon and herring. Descriptions of the type of "on line" management required by such vulnerable stocks will be found in companion case studies on Pacific salmon and herring and Atlantic herring.

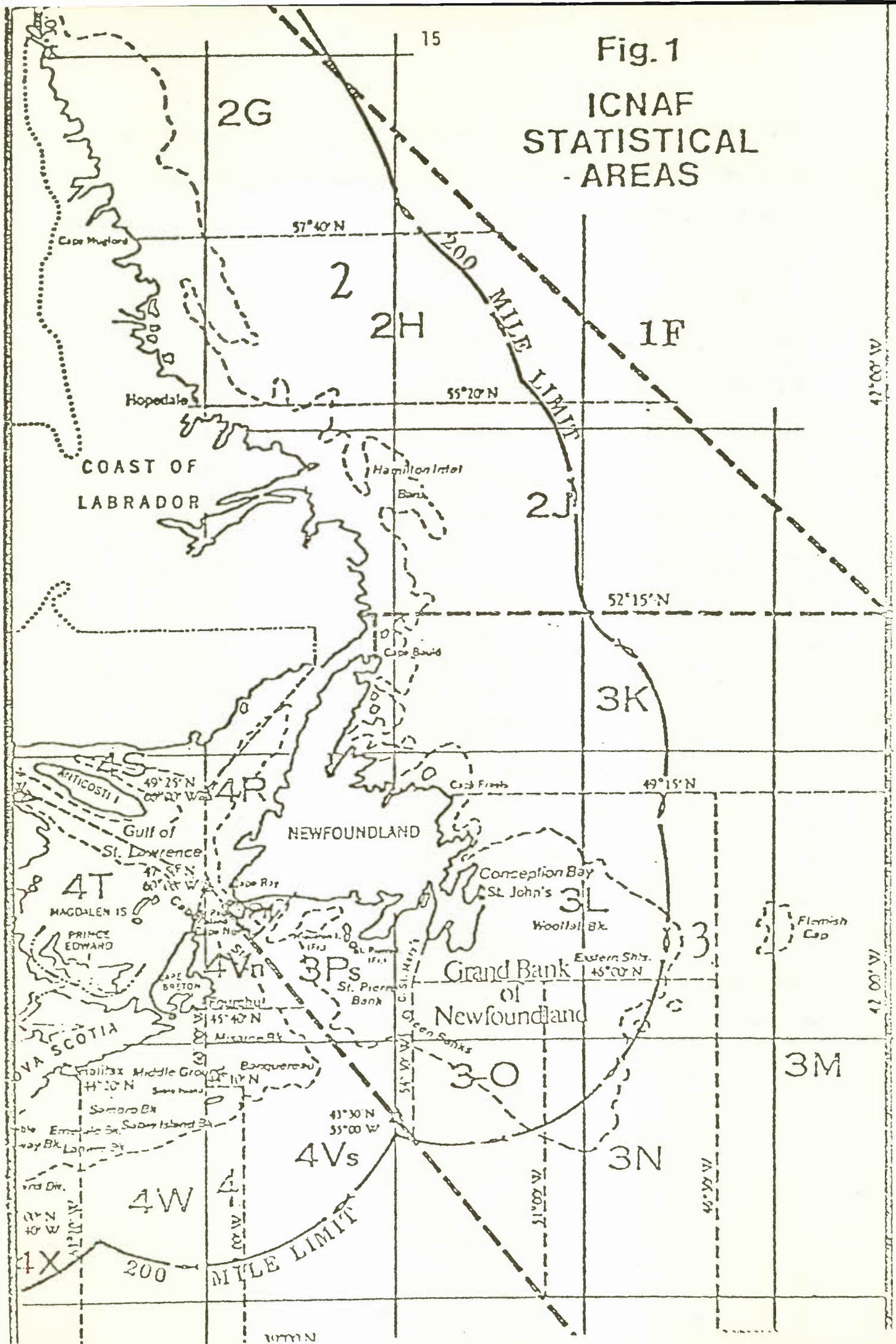
The spawning characteristics, both in terms of their location and timing, are of particular importance to the offshore fishery. Consider first Figure 1. (Newfoundland and Labrador, Department of Fisheries (1978a)) which shows the waters off Labrador, Newfoundland and the Maritime provinces divided into the sub-areas used by ICNAF for analysis. Northern cod is to be found in ICNAF sub-areas, or divisions, 2J, 3K and 3L.

Spawning of northern cod takes place offshore with particularly heavy concentrations occurring in 2J, on the Hamilton Inlet Bank, and in northern 3K. It was the heavy concentrations of cod in these areas during the spawning and associated pre-spawning and post-spawning seasons which attracted the foreign fleets in the late 1950s and 1960s (Pinhorn(1976)).

The spawning season comes in February and March, while the pre-spawning and post-spawning seasons come in January and March-April

Fig. 1

ICNAF
STATISTICAL
AREAS



respectively. Thus, since the late 1950s, the heart of the offshore season has run from January to April. After April the catch rates offshore tend to fall precipitously in 2J, 3K and 3L as well (Munro (1980, Chapters 4 and 5)).⁴

Finally, we consider the annual inshore/offshore migrations of the cod population. In the late spring and early summer, following the offshore season, some fraction of the biomass moves inshore. The inshore migration has been described as being primarily a feeding migration (Pinhorn (1976, p.6)) as the cod follow pelagic species, such as capelin and herring, upon which the cod prey. The inshore migration tends to be led by, and is at the same time more complete for, smaller fish (NORDCO (1981, 105)). The relevance of this fact will become apparent at a later point.

In the late summer and autumn a reverse movement occurs. This is largely in response to falling water temperatures (Pinhorn (1976, 6)).

The short, intensive inshore season is based upon the inward migration. What fraction of the cod population surviving the offshore season actually moves inshore, and is thus subject to harvesting by the inshore sector, is not known, although the question is being currently researched (Munro (1980, Chapter 4)). The fact that one is dealing with a complex of stocks, rather than a single stock, does not make it any easier to arrive at a satisfactory answer.

3. The Industry

(a) Primary Sector

Inshore Sector. That part of the inshore sector harvesting northern, or as the biologists prefer to call it 2J3KL, cod fits the general description of the inshore sector given in the Introduction. The fishermen are dispersed geographically and use labour intensive operations.

As has already been indicated, there are many different types of gear used in harvesting cod inshore. Two types of gear, however, are dominant. These are the cod trap and the gillnet. In the late 1970s cod traps and gillnets accounted for about 45 and 40 per cent respectively of the inshore harvest of northern cod (Newfoundland and Labrador (1978a, Vol. II)).

The cod trap is an entirely passive gear which is attached to or placed close to shore in so called "berths." The trap is best described as a large "room" made of net with a floor, walls, doors, but no ceiling. The trap extends from the surface to the bottom. Attached to the "room" is a leader consisting of a wall of net also extending from the surface to the bottom. It runs from the shore or sunken reef to which the trap is attached to the door of the trap. The leader serves to deflect cod moving along the shore line into the trap (Brothers (1975, 15-23)).

While cod traps vary greatly in size, a typical cod trap can be thought of as having a depth of ten fathoms, a "room" perimeter of 60 fathoms. (See Figure 2.)

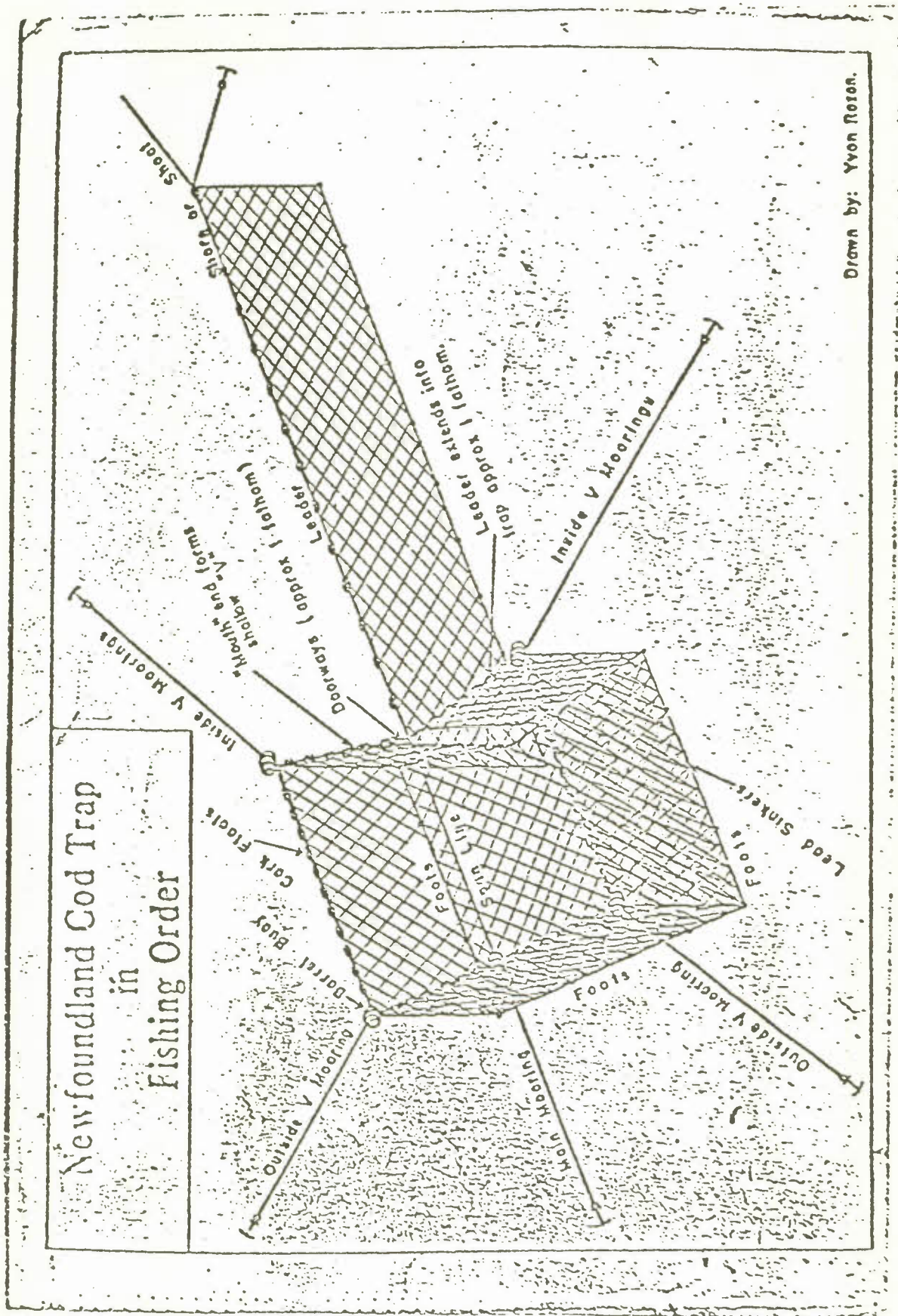


Figure 2

Source: Brothers (1975, 15).

The trap season is very short, lasting in a given locality, for no more than six to eight weeks during the late spring and summer. The resultant "trap glut" creates, as we shall see at a later point, serious difficulties for the processing sector.

The gill net is a much simpler gear. It consists of a wall of net 50 fathoms in length. The nets are normally set in "fleets," where a fleet may consist of 20 to 30 nets linked together, which are secured to the sea bed. Lead ropes extend from the ends of the fleet to inflatable buoys at the surface (Brothers (1975, 28-29)).

While many types of vessels can be used to tend traps and gillnets, two classes predominate. These are the so-called longliners and the trap-skiffs. The mis-named longliner varies in size from 35 feet length overall (LOA) to 65 feet LOA. It is typically a decked vessel carrying crews of two to six men and, depending upon size, can venture out as much as 40 to 50 miles from shore. (Newfoundland and Labrador, Department of Fisheries (1978a, Vol. IA, 78)). In the mid to late 1970s longliners accounted for approximately 15 per cent of the trap caught cod and 55 per cent of the cod caught by gillnets. (Newfoundland and Labrador, Department of Fisheries (1978a, Vol. II)).

The second type of vessel, is the trapskiff which ranges in size from 25 to 35 feet LOA and carries a crew of three to seven men (Newfoundland and Labrador, Department of Fisheries (1978a, Vol. IA, 77)). It is typically an undecked vessel working close inshore.

While vessels of this class dominate the trap harvest of northern cod (85 per cent) they also account for a substantial share of the cod harvested by gillnet -- 45 per cent (Newfoundland and Labrador, Department of

Fisheries (1978a, Vol. II)). However, the trap is central to the operation of the trapskiff. Gillnets (and other gear) tend to be used before and after the short trap season. It is questionable whether it would be feasible economically for skiff owners to harvest northern cod if restricted to non-trap gear (Munro (1980, Chapter 4)). Thus the percentage of the inshore northern cod harvest accounted for by traps, which was cited earlier, understates the importance of this gear.

There is one other aspect of the comparison between trapskiffs and longliners which deserves comment before we turn to a description of the offshore sector. At a later point in the case study, reference will be made to relative ease of entry to the inshore sector. One aspect of ease of entry is the barrier posed by the capital cost of vessels and gear. Here there exists a wide discrepancy between the two classes of vessels. For example, as of 1979 the capital costs, inclusive of gear, for a new trapskiff were \$20,000; for a new small longliner 45 feet or less LOA, \$86,000; and for a new medium size longliner, 52 to 55 feet LOA, \$360,000 (Schrunk, Tsoa and Roy (1980)).

Offshore. Since Canadian participation in the direct offshore 2J3KL cod fishery was negligible until a few years ago, it is difficult to provide an accurate description of the Canadian offshore sector as it pertains to northern cod. Rather we shall have to review the offshore fishery as it existed in the past and speculate on how the Canadian offshore fishery is likely to evolve.

In the era when the offshore fishery was dominated by distant water nations, some of the fishing was done with gillnets, e.g. Portugal. Most

of the harvesting, however, was done with trawlers in excess of 120 feet LOA. It is likely that the Canadian offshore fishery will be largely, if not exclusively, trawler based.

In the debate over the nature of the forthcoming offshore northern cod fishery, three classes of trawlers have been considered. The first class consists of wetfish trawlers. Groundfish harvested by these vessels are gutted and packed in ice. If the quality of the fish is to be maintained, the fish must be delivered to the processing plant no more than nine days after capture (Newfoundland and Labrador, Department of Fisheries (1978b)). All but a few vessels in the Canadian Atlantic trawler fleet are wetfish trawlers.⁵

The fact that fish harvested by wetfish trawlers must be delivered on shore shortly after capture led, at one time, to serious doubts about the extent to which wetfish trawlers could be used in exploiting northern cod. The offshore trawler fishery had, since the late 1950s, been focussed on spawning concentrations in 2J and northern 3K during the first four months of the year. Ice conditions were often severe.

It was argued that, if wetfish trawlers were used, even though they be ice reinforced, ice conditions combined with the risk of spoilage of catch would result in an uneconomically small part of the vessels' steaming time being spent in actual fishing. Thus a major study commissioned by the Newfoundland Department of Fisheries on the feasibility of harvesting northern cod offshore for delivery to Newfoundland seasonal plants argued that one should assume that no wetfish trawlers would operate in 2J during the offshore fishery (Newfoundland and Labrador, Department of Fisheries (19786, Vol. IIc v-22)).

As a consequence of the apparent disadvantages associated with wetfish trawlers, consideration was given to freezer trawlers. These vessels had the advantage that they could remain at sea for lengthy periods without the risk of spoilage. They had, moreover, been used extensively by distant water nations in exploiting northern cod.

Two classes were considered, these being "conventional" and factory freezer trawlers. "Conventional" freezer trawlers are designed to freeze fish in the round for delivery to shore based processing plants. Factory freezers are equipped to process the fish on board.

While both classes offer protection against the quality problems associated with wetfish trawlers, they have the disadvantage that their capital costs far exceed those of wetfish trawlers. With ice-reinforcing a wetfish trawler could be expected to cost (1979 dollars) \$5 to 6 million. A "conventional" freezer-trawler new would cost \$8.5 million, while a new factory freezer would cost \$20 million (both figures in 1979 dollars)(Canada, Fisheries and Oceans (1979, 48)). It was not at all clear that these expensive vessels could be used effectively throughout the year (Munro (1980, Chapter 5)).

From the point of view of the Newfoundland government, the freezer trawlers did and do have a much more serious disadvantage. They enhance the feasibility of harvesting northern cod for delivery to plants in "other" provinces, i.e. Nova Scotia. Hence the Newfoundland government has denied with some vehemence that there is any justification for the use of freezer trawlers in harvesting northern cod (Newfoundland and Labrador (1980, 57)).

The experience so far has tended to support the pro-wetfish trawler school.

The Canadian offshore 2J3KL cod quota has to date been successfully taken with wetfish trawlers. Indeed, in 1981 the authorities found it necessary to close the offshore fishery about half way through the regular season.

It must also be said, however, that the history of a major Canadian directed offshore northern cod fishery has been a very short one. It is not entirely clear, for example, to what extent the success of the wetfish trawlers is attributable to favourable weather conditions. Thus while the debate has unquestionably shifted in favour of the wetfish trawlers, one hesitates to declare the wetfish trawlers' victory a complete one.

There has also been a suggestion put forth by the Newfoundland Oceans Research and Development Corporation (NORDCO) and others that a substantial segment of the offshore harvest be taken by an expanded middle distance fleet (vessels greater than 65 feet in length, but less than 120 feet). The NORDCO analysis suggests that what would be required is a fleet of offshore draggers (small trawlers) (NORDCO (1981, 180-181)). It is very difficult to assess the validity of this argument as the economics of harvesting northern cod by such vessels is largely unknown.

We can, however, comment in passing that one factor which is certain to complicate the aforementioned economics is the finding of a recent federal government study through the 1980s, at least, one can look forward to excess wetfish trawler capacity in the Gulf of St. Lawrence and Scotian Shelf (Canada, Fisheries and Oceans (1979, 44)). Thus it may prove to be far less costly over the next decade to harvest northern cod offshore by reallocating existing wetfish trawler capacity than to employ a newly constructed fleet of middle distance vessels.

(b) Secondary Sector

The Newfoundland processors of cod are basically producers of frozen and salted products. The frozen products appear in the form of fillet packs and blocks. Of this output, approximately 80 per cent is shipped to the American market (Munro (1980, Chapter 6)). The blocks shipped to the United States are further processed in that country into sticks and portions. The reason for the completion of processing in the United States can be found in the American tariff structure.

TABLE 3

Percentage Breakdown of Value of Output of Major Processed Cod Products in Newfoundland: Average of 1977 and 1978

| Product Category | Percentage of Total |
|------------------|---------------------|
| Frozen | 71.2 |
| Salted | 22.9 |
| Fresh | 5.9 |
| Total | 100.0 |

* Fish sticks, portions, meal and oil are excluded since separate data by species are not available for these items.

Source: Canada, Department of Fisheries and Oceans (1980b, Vol. II).

Prior to the Second World War, all but a small fraction of the Newfoundland cod harvest was put to salt. Major markets were and are found in the Caribbean and western Europe.

Frozen cod products became firmly established by the Second World War. Since then, the salt cod segment of the industry has experienced a steady decline. Whether the decline can be reversed is difficult to say.

A major policy issue confronting the Canadian authorities is how the harvest of northern cod should be divided between the offshore and inshore harvesting sectors. If it can be assumed that the bulk of the harvests will be processed in Newfoundland (as is reasonable), then the division will have important implications for the processing sector.

First the division will affect the seasonality of plant operations. The highly seasonal nature of both the inshore and offshore harvesting operations have been noted.

An example of the effects of seasonality is provided by plants on the northeast coast which are primarily processors of cod and which are wholly dependent upon the inshore sector. Some of these plants operate no more than five months of the year (Newfoundland and Labrador, Department of Fisheries (1978a, Vol IA, 23)). While published data are not available, recent analysis suggests the unit output costs of a processing plant operating five months of the year could be as much as 40 per cent higher than those of a comparable plant operating twelve months of the year (Munro (1980, Chapter 4)).

Secondly, the division of the harvest also holds implications for the quality of throughput in the plants. This in turn is related to the fact that a large fraction of the inshore harvest of northern cod is taken by traps.

As the recent study on northern cod by NORDCO emphasises, the inward migration of cod tends to be dominated by younger fish. This combined with the fact that the cod trap is a non-selective gear results in cod trap harvests containing a larger percentage of small fish than cod harvests taken by other gear (NORDCO (1981, 172)).

In addition to the size of trap caught cod being relatively small, the flesh of such cod tends to be relatively soft. This can be explained in part by the shortness of the trap season, which tends to produce gluts and hence severe handling problems, and in part by summer water temperatures close inshore (Munro (1980, Chapter 4)).

The consequences of having throughput in a processing plant which consists of small soft, as opposed to large firm, cod are three-fold. First the rate of fillet recovery or yield is lower for small cod. Secondly, the amount of time required to process a unit of raw fish is greater when the throughput is small, soft cod as opposed to the large, firm cod. The combined result is that the cost of producing a unit of fillets (exclusive of cost of raw material) is significantly greater when small soft, as opposed to large, firm, cod constitute the throughput. For example, in a typical plant equipped to produce frozen groundfish products the cost (exclusive of cost of raw material)^{of} producing a pound of fillets (as of 1979) when the throughput consisted of small soft cod weighing 1.7 pounds on average was 105.0¢. The cost of producing a pound of fillets from raw

material consisting of large firm cod weighing 7 pounds on average was 40.6¢ (Munro (1980, Chapter 4)).

Thirdly, the quality of the throughput can determine the nature of final output. Cod fillets may be shipped as relatively high priced consumer or restaurant packs or they may be shipped as relatively low priced blocks to be used for fish-sticks and portions. The price differential is in the order of 20 to 25 per cent (Munro (1980, Chapter 4)). Fillets produced from small soft cod invariably leave the plant in the form of blocks.

How the northern cod harvest will be divided between offshore and inshore in the future is, of course, unknown. At present, the policy of the federal government is to allocate approximately two-thirds of the harvest to the inshore sector (Haché (1981)). The Newfoundland government, on the other hand, is insistent that a full 85 per cent of the harvest be allocated to the inshore sector (Newfoundland and Labrador (1980, 57)).⁶

4. A Brief History of the Regulation of the Northern Cod Fishery Prior to 1977

We shall in this section offer a short history of the regulation of both the inshore and offshore sectors of the northern cod fishery. Although the participation of Canadian fleets in the offshore fishery was minimal before 1977 the history of the management of the offshore fishery nonetheless deserves study. Canada did participate in the management of the offshore through ICNAF. Moreover, one can argue that ICNAF's management experience prior to 1977 cannot fail to influence Canada's management policies now that the entire fishery is a Canadian responsibility.

Although the inshore and offshore fisheries were subject to control by different regulatory bodies, the management regimes of the two segments of the fishery were linked by a common doctrine. This was that the resource should be "fully utilized." That is to say the aim of management should be to stabilize the resource at the maximum sustainable yield (MSY). The history of northern cod provides one of the more interesting examples of the failure of this doctrine to serve as an adequate guide to management.

(a) Inshore Sector

Prior to 1977, fishermen in the Newfoundland inshore groundfishery were subject to certain gear restrictions, e.g., minimum mesh sizes,⁷ but were faced with no restrictions on entry. Indeed, we shall argue that both federal and provincial policies seemed designed to encourage

entry, rather than the reverse.

The programme of gear restrictions was obviously consistent with a policy of MSY. What is much less obvious is that what we might call the programme of unlimited entry, was also consistent with MSY.

In order to achieve MSY it is necessary to ensure that immature fish are not harvested, hence the need for gear restrictions such as minimum mesh sizes. These specific restrictions may not be adequate however. Excessive depletion of the resource may occur unless more general restrictions on harvesting are imposed (Gulland (1974, Chapter 6)). Such restrictions appeared to be unnecessary in the inshore sector.

On the contrary, the history of the northern cod fishery appeared to indicate that, if harvesting were restricted to the inshore sector alone, the resource would be underutilized. It will be recalled from the discussion of the biological aspects of northern cod, that only a fraction of the biomass moved inshore each spring and summer. Marine biologists have estimated that MSY for northern cod is in the order of 550,000 tonnes per year (Pinhorn (1976, 6)). Before the late 1950s the total annual harvest averaged 250,000 tonnes (McCracken (1975, 2)), i.e., less than half of MSY.⁸

It was not until the expansion of foreign offshore fishing effort in the late 1950s and 1960s that the resource came to be "fully utilized." As a consequence, it seemed apparent to the Canadian government and to ICNAF alike that when and if measures were required to prevent excessive depletion of the resource, they should be directed at the offshore sector.

The responsibility for the regulation of the inshore sector lay, of course, with the federal government. The federal government was not simply

content to allow open access to the sector. It established and developed a subsidy programme which actively encouraged entry to the inshore sector in general.⁹

While there were and are many aspects of the subsidy programme, perhaps the most important is to be found in the application of unemployment insurance to fisheries.¹⁰ After 1957, Part VII of the Unemployment Insurance Regulations made it possible for seasonal inshore fishermen to collect unemployment insurance and to do so even though they were self employed.

A recent study commissioned by the Economic Council of Canada shows that an inshore fisherman harvesting northern cod who fishes for 15 weeks during a given year becomes eligible for 26 weeks' worth of unemployment insurance benefits. The study also demonstrates that the fisherman could expect to enjoy slightly more income from unemployment insurance than he would from his fishing activities. Not surprisingly, the authors of the study conclude that the unemployment insurance system, as currently managed, provides a powerful incentive to prospective fishermen to enter inshore fisheries (Ferris and Plourde (1980, Chapter 4)).

Although the provincial government bears no direct responsibility for the inshore sector, it has supplemented the federal subsidy programme with one of its own. Thus, for example, to would-be purchasers of small vessels it offers a bounty equal to 35 per cent of the capital cost. Other examples are provided by its subsidies on the purchase of gear and by its policy of exempting fuel used by inshore fishermen from the provincial fuel tax (Newfoundland and Labrador, Department of Fisheries (1978a, Vol. IA, 34ff)).

The incentive to both levels of government to encourage entry into the inshore fishery was provided by Newfoundland's unemployment problem. Provincial unemployment in the past was, as it is in the present, both chronic and severe. In the recent past, for example, seasonal rates of unemployment in regions outside the St. John's area ran as high as 30 per cent (Munro (1977, 32)).

The inshore fishery must have seemed like a natural employer of the last resort. The fish were there for the taking and, except in certain isolated cases such as lobster and salmon, encouraging entry into the sector posed no biological threat to the resources.

While increasing the number of inshore fishermen in the northern cod fishery might not threaten the resource, it could lead to a redundancy of fishing effort. This is illustrated by the trap fishery. Increasing the number of traps beyond a certain point in a given community may do little or nothing to increase the total harvest of cod. Berths for cod traps vary in terms of quality. Once the prime berths are utilized, it may well be found that additional traps placed in inferior berths do little more than capture fish which would otherwise have been captured by traps in prime berths. Thus, in the early 1970s one authority on the Newfoundland fisheries was able to argue that a significant reduction in the number of traps (and other inshore gear used in harvesting cod), could be expected to have a negligible impact upon the total harvest (Copes (1972), 79)).

If indeed there was serious redundancy in the northern cod inshore fishery in the years prior to EFJ, it was effectively masked from the mid-1960s onwards. For the next decade the encouragement to enter the inshore fishery given by the two levels of government was more

than offset by the dwindling resource available inshore. This is shown in Table 4. In the mid-1970s a Newfoundland report on fisheries addressed itself to the issue of redundancy in the inshore fisheries and rejected the proposition out of hand (Alexander et al. (1974, 19)).

TABLE 4.

Estimated Number of Newfoundland Groundfish* Fishermen**
in ICNAF Sub-Areas 2J, 3K and 3L
1960-1976 (selected years)

| Year | Number of Fishermen | Year | Number of Fishermen |
|------|---------------------|------|---------------------|
| 1960 | 10,925 | 1970 | 8,265 |
| 1962 | 11,725 | 1972 | 6,653 |
| 1964 | 13,319 | 1974 | n/a |
| 1966 | 11,100 | 1976 | 7,915 |
| 1968 | 10,224 | | |

* Although groundfish species other than cod were harvested, cod was of overwhelming importance.

** This includes offshore fishermen as well, but their numbers were negligible over this period

Source: Courtesy of Canada, Department of Fisheries and Oceans, Economics Branch, St. John's.

By the decade of the 1970s, however, the federal government, at least began to have serious doubts about the wisdom of the policy of unlimited entry for the inshore groundfishery, and did begin to worry about problems of redundancy. In a major policy document on fisheries issued by the federal government in 1976, it was stated categorically that the Atlantic inshore fisheries in general were suffering from redundant vessels and fishermen (Canada, Department of the Environment, Fisheries and Marine Service (1976, 40))

Three years earlier the federal government had announced a freeze on all subsidies for new fishing vessel construction on the Atlantic coast and the establishment of an Atlantic Licence Policy Review Committee to study Atlantic coast fisheries and make recommendations. In its recommendations, the committee called for the licensing of all vessels in the groundfishery between 35 and 140 feet in length and for the freezing of their number at the 1973 level. Vessels in the groundfishery under 35 feet should also be licensed, stated the committee, but the vessels should not be subject to "immediate control" (Alexander et al. (1974, 12-13)).

In November of 1973 the federal fisheries minister announced his intention to have all commercial fishing vessels and gear registered with Fisheries and Marine Service and to license all vessels, skippers and operators (Alexander et al. (1974, 14)). The announcement was greeted without enthusiasm in Newfoundland (Alexander et al. (1974, 14)).

The new licensing arrangements did lead to the licensing of all fishermen in Newfoundland as of 1974. It did nothing, however, to limit entry to the Newfoundland inshore groundfishery before 1977.

(b) Offshore Sector

The regulation of the offshore northern cod fishery was the responsibility of ICNAF from the time of that body's inception in 1949 until the advent of Canadian EFJ. The central rule of management for ICNAF was, as we indicated at an earlier point, MSY (Doubleday (1978, 59)).

In the early years of its existence, the management of the offshore northern cod fishery presented few difficulties to ICNAF as the number of countries exploiting the resource was small. ICNAF contented itself with imposing gear regulations such as minimum mesh sizes.

When the number of participants in the fishery began to grow in the mid-1950s, ICNAF did nothing to halt or regulate the expansion, other than to impose the aforementioned gear restrictions on the new participants. This policy of laissez-faire was not inconsistent with the doctrine of MSY.

We have already argued that the northern cod stock was being "underutilized" if one accepted the MSY rule. Thus the initial expansion of fishing effort could be viewed as a corrective.

If one returns to Table 2, it can be seen that the total harvest reached the MSY level by the early 1960s, but then exceeded it by a wide margin by the late 1960s. This was no necessary cause for alarm. The stock had hitherto been underutilized on the basis of the MSY criterion. In order to achieve MSY the stock or biomass would have to

be reduced. One would not be surprised to find that as the reduction was taking place large, but unsustainable, harvests would be enjoyed. Indeed in 1975 a senior federal government biologist made this very point in reviewing the history of the northern cod fishery (McCracken (1975, 2)).

Although ICNAF continued to rely upon gear regulations alone as fishing effort increased in the Northwest Atlantic, scientists within ICNAF began to warn as early as 1964-1965 that gear regulations alone were inadequate for control purposes. Harvest quotas were called for (May et al. (1980, 2)). By the end of the decade the scientists' efforts bore fruit. Harvesting quotas or total allowable catches (TACs) were established for various stocks. The TACs were then divided among the ICNAF members by nations. The first TACs, established for haddock and American plaice were put into effect for the harvest year 1969-70 (Munro (1980, Chapter 3)).

The first total allowable catch for northern cod was established in 1972 for the harvest year 1973. In the following table we show the TACs¹¹ for the years 1973 to 1976 and compare them with the actual harvests for those years.

TABLE 5

Northern Cod: Total Allowable Catches and Actual Harvests
1973-1976 ('000s of tonnes)

| Year | 1973 | 1974 | 1975 | 1976 |
|---------|-------|-------|-------|-------|
| TAC | 665.5 | 656.7 | 554.0 | 300.0 |
| Harvest | 354.5 | 372.6 | 287.5 | 214.2 |

Source: ICNAF, Redbook 1978, Table VIII.

If we bear in mind the MSY estimate for this stock of 550,000 tonnes, it can be seen that the quotas in 1973 and 1974 were not unduly restrictive. On the contrary, they exceed MSY by a significant margin. The reason given for the large 1973 TAC was two exceptionally strong cohorts or year classes were expected to "recruit to," i.e., enter, the fishery. Hence, a large TAC for that year was warranted. Weather conditions were severe in 1973 with the consequence that the actual harvest fell well below the TAC. In light of this underexploitation, the 1974 TAC was also set at a high level (Munro (1980, Chapter 3)).¹²

By 1975, the TAC was set at a level roughly equal to MSY. The ICNAF managers thus appeared to be on target. Indeed, during 1975, the aforementioned senior federal government biologist said just that in a report to the annual meeting of the Fisheries Council of

Canada. He went on to state that, if the then present quotas were maintained, there should be little risk of overfishing (McCracken (1975, 2)).

Yet during this same year the Canadian Atlantic coastal groundfish industry had already experienced one year of deep crisis and would not emerge from the crisis until the next year. The doctrine of MSY, as it governed the management of northern cod and all other major groundfish stocks off Atlantic Canada, had led, from Canada's point of view at least, to economic disaster. At Canada's insistence, it will be recalled, ICNAF's policy shifted abruptly. The doctrine of MSY was abandoned.

What emerged to replace MSY was a rule of management popularly known as the $F_{0.1}$ rule, where F denotes fishing mortality (i.e., the reduction in the biomass due to fishing activity). The new rule, which appears to owe its origin to the prominent marine biologist John Gulland, states that harvesting should proceed up to the point that the marginal sustainable yield is equal to one-tenth the CPUE which would be enjoyed if the stock were lightly fished (Munro (1977, 39)).

The reader may be forgiven for finding the definition somewhat opaque. Guidance can, however, be obtained from two articles by Gulland in which he discusses the rule (Gulland and Boerma (1973); Gulland and Robinson (1973)). These articles reveal that the rule rests upon the earlier standard economic model of fisheries management in which optimal management is linked to the maximization of sustainable resource rent. It can be easily demonstrated that, so long as harvesting costs are positive and sensitive to the size of the stock or biomass, maximizing sustainable resource rent will be a more conservationist policy than

that of achieving MSY. That is to say, the target biomass associated in the long run with rent maximization will prove to be larger than that associated with MSY.

The $F_{0.1}$ rule, which was designed to be no more than a rule of thumb, calls for stabilizing a given resource at a level somewhat larger than that associated with MSY. The equilibrium sustainable yield can be expected to be 10 to 15 per cent below MSY (Munro (1980, Chapter 2)).

As we shall see in the next section, Fisheries and Oceans Canada in its post-EFJ management of northern cod uses the $F_{0.1}$ rule as no more than an initial point of reference.

5. Current and Future Management of the Resource

When Canada gained full management responsibility for northern cod, there was no sharp break with the policy which had been evolving within ICNAF before the advent of EFJ. Indeed Canada agreed that during the first year of EFJ she would implement quota arrangements arrived at at ICNAF's annual meeting for 1976.

The dethroning of the MSY doctrine by ICNAF and its replacement by the $F_{0.1}$ rule was an admission by ICNAF that its previous policy had led to undue depletion of the stocks under its control. This was particularly true of 2J3KL (northern) cod. Hence, what was obviously called for was a programme of "investing" in the northern cod stock, i.e., of rebuilding the stock. The reward would come in the form of higher sustained yields and lower harvesting costs in the future.

As with any investment programme, however, future rewards could come only at the cost of current sacrifices. With respect to stock rebuilding, this meant that current harvests would have to be reduced below sustainable yield. Thus, whereas the 1976 TAC had been set at a seemingly conservative 300,000 tonnes, the 1977 TAC was set at only 150,000 tonnes.¹³

The 1977 TAC, established by ICNAF in 1976, was based upon the $F_{0.1}$ rule. During 1977 the Canadian authorities decided to increase the rate of "investment" in the stock. A more rapid rate of recovery of the stock, it was hoped, would speed the recovery of the battered fortunes of the inshore sector (Munro (1980, Chapter 3)). Consequently, the TAC for 1978 was reduced further to 135,000 tonnes (Canada, Department of Fisheries and Oceans (1980a, 43)).

In subsequent years, the authorities have continued to maintain its very conservative exploitation policy. Some of the rewards of investment have, however, began to appear. The 1981 TAC, for example, was 200,000 tonnes, while the TAC for 1987 is currently projected to be 370,000 tonnes (Canada, Department of Fisheries and Oceans (1981, 49)).

The technique used in regulating the harvest, and thus in controlling the growth of the stock, was, in the first few years after the advent of EFJ, not dissimilar to that used during the ICNAF era. Strict quotas were imposed on offshore harvests, be they foreign or domestic. The remainder of the TAC constituted a so-called inshore allowance. This represented, not what the inshore sector was to be allowed to harvest, but rather what the authorities expected to be harvested inshore, given the state of the stock, the anticipated level of fishing effort inshore and the projected offshore harvest. Thus the offshore harvest was seen to constitute the lever of control.

In 1980, however, the federal government in drafting its management plan for 2J3KL cod for the 1981 season introduced an important change. The inshore allowance was to be replaced by a quota with the implication that, should the inshore fishery tend to exceed its quota limit, the fishery would be shut down (Beckett (1981)). Undoubtedly, this shift in policy should be seen as part of the federal government's attempt to exert some degree of control over the inshore fishery. The motivation for the federal government's shift in policy will become obvious at a later point.

The proposed division of the northern cod 1981 TAC is shown below:

TABLE 6

Management Plan for Northern Cod - 1981

| | |
|--|----------------|
| Total Allowable Catch | 200,000 tonnes |
| Foreign Quota | 15,000 tonnes |
| Quota for Domestic Vessels Greater than 65 Feet | 65,000 tonnes |
| Inshore Quota | 120,000 tonnes |

Source: Canada, Department of Fisheries and Oceans (1980c, 5).

The point has been made many times in companion case studies that maintaining a fishery resource in physical terms is no more than the first step towards effective management. Thus, the rebuilding of the northern cod stock complex, be it on the basis of the $F_{0.1}$ rule or some rule more conservative, does no more than allow society the opportunity to enjoy a positive return. If measures are not introduced to ensure that the harvest is taken in an efficient manner, little or no return on the resource may be forthcoming. Indeed the entire "investment" programme could prove to be an exercise in futility.

The management issues which the authorities must now confront successfully if the resource is to be harvested in a reasonably efficient (let alone optimal) manner can be listed as follows:

- (i) The division of the TAC between inshore and offshore sectors. The divisions shown in the 1981 management plan is the product of short run planning.

- (ii) The degree of participation of distant water fleets in the offshore harvests.
- (iii) The effective control of domestic fishing effort offshore and of fishing effort inshore.

These issues are, of course, not independent of one another, nor are they independent of the setting of the TAC. It goes without saying that the problems posed by these issues must be solved simultaneously.

The aforementioned issues are all affected by a problem which is more political than economic, but which is important nonetheless. With the coming of EFJ, the northern cod stock complex became Canadian property. It did not become Newfoundland property. Other Atlantic coast provinces thus have a claim upon the offshore harvest, a claim which some have been exercising.

The Newfoundland government has responded with vigour and has argued that the optimal level of northern cod harvests destined for non-Newfoundland plants is zero. ". . . management of the Province's fishery resource must proceed from the basic principle that the people of Newfoundland and Labrador have a historic and moral right to the economic benefits which can be derived from the resources in the surrounding sea" (Newfoundland and Labrador (1980, 57)). As we shall see at various points in the discussion inter-provincial rivalry over access to the resource can, if not resolved, make it difficult to implement an effective management policy.¹⁴

Issues (i) and (ii) have been explored at length elsewhere (Munro (1980, Chapters 4 and 5)). We shall, therefore, comment on them only briefly.

Our profile of the structure of the industry made it clear that the optimal division of the harvest between the two sectors rests upon much more than relative harvesting costs. An optimal division will reflect as well the impact of that division upon the costs and revenues of the processing sector. We return to this question when we discuss the control of fishing effort in the two sectors.

The issue of distant water nation participation relates simply to the question as to when, if ever, it would be beneficial to hire the services of distant water nations as harvesters or processors. For example, should it prove to be the case in the future that it was in fact desirable to use freezer trawlers in exploiting northern cod off-shore then a case might be made for chartering foreign freezer trawlers rather than building up a domestic fleet of such vessels (Munro (1980, Chapter 5)).

It is the third issue to which we must devote our attention. The chief problem which has to be dealt with is the one discussed in most of the companion case studies, this being the one of ensuring that resource rent is not dissipated through an emergence of excessive labour and capital in the harvesting sector.

Control and regulation of fishing effort in the offshore sector is relatively easy. As far as foreign fishing effort is concerned, there is no problem, given that the foreigners do not exceed their quotas. If foreigners choose to expend fishing effort in a wasteful manner, the burden falls upon them alone.

With regard to domestic fishing effort, it will be recalled that the capital used in offshore harvesting consists of large, expensive trawlers. This means in turn that the fleet consists of a relatively

small number of company owned vessels. Thus, for example, as of 1977 the entire Newfoundland trawler fleet consisted of 80 vessels owned by a handful of companies (Newfoundland and Labrador, Department of Fisheries (1978a, Vol. 1A, 78)).

As a consequence, policing the sector at the present time is straightforward.¹⁵ Fleet capacity is rigidly controlled by the federal government through its licensing policy. The government demonstrated during the groundfish crisis of the mid-1970s that it could not merely regulate offshore fleet capacity on the Atlantic coast, but freeze it.¹⁶

Once a domestic trawler is given permission to harvest, its operations are closely monitored. The vessel, while at sea, is required to report its catch and position on a daily basis to Fisheries and Oceans Canada via its company. Falsification of such data can lead to a suspension of the vessel's licence (Canada, Department of Fisheries and Oceans (1980c, 1)). Since even an ordinary wetfish trawler may represent an investment of \$4.5 - 5 million (1978 dollars), the threat of licence suspension cannot be taken lightly.

There is, however, one flaw in the system of control over offshore effort. The domestic offshore quota is a global one. Under this system, popularly known as the "Olympics system" (whoever wins the race wins the prize), companies compete with one another for shares of the quota (Beckett (1980)). The likelihood that there will be economic waste under this system is great. The companies have a natural incentive to devote maximum fishing effort at the beginning of the season. This in turn can lead to plant gluts and disrupted harvest schedules.

The 1981 offshore season provides an example. On the basis of the history of the fishery, one could have expected the season to run from

January through to April. Fisheries and Oceans Canada was forced to announce, however, that the offshore season was to be closed on February 20th. The minister complained at the time of "disorderly harvesting" of 2J3KL cod by the companies (Canadian Fishing Report (March, 1981, 13)).

All of the case studies on fisheries regulations address themselves to the question of the feasibility of using individual transferable harvest quotas as a means of mitigating the problem of wasteful fishing effort. It behooves us, therefore, to raise this question with respect to northern cod. Could the "Olympics system" be replaced with a system of company quotas (transferable) with the hope that disorderly harvesting would vanish?

If a system of quotas were in effect the incentive for companies to "scramble" at the beginning of the season would be at least mitigated, if not eliminated. Each company would be assured a minimum share of the global offshore harvest. If, in addition, the quotas were transferable efficiency should be further promoted in that less efficient companies would have an incentive to sell off harvesting rights to their more efficient competitors.

Given the relatively small fleet and the small number of companies involved, it can be argued that the offshore northern cod fishery should be a major candidate for such a quota scheme. Indeed one would probably have difficulty in finding an example among the fisheries discussed in the set of case studies in which a system of individual harvest quotas would be more readily applicable.¹⁸

There is, however, a potential impediment to the scheme, one which is of considerable importance. We refer back to the inter-provincial

rivalry over the resource. Even if the quotas were transferable, and even though the economics of the offshore fishery would favour processing the catch in Newfoundland, one can well imagine that the Newfoundland government would fear that the scheme would institutionalize the claims of "other" provinces to a share of the harvest. Hence, one could anticipate vehement objections from St. John's.

Management of the inshore sector presents a much more challenging problem. Whereas the entire Newfoundland trawler fleet consists of less than 100 vessels (in 1977), there could be found in 2J+3K+3L alone 2,098 vessels between 25 and 65 LOA and more than 6,000 vessels under 25 feet (Newfoundland and Labrador, Department of Fisheries (1978a, Vol. II)). Most of the vessels were and are individually owned, and as we have stressed at various points in his study, they are dispersed over a wide geographical area. Controlling fishing effort in these circumstances is indeed a formidable task.

We should perhaps first ask whether there is really any point in attempting to limit the amount of fishing effort in this sector. It has been seen in our previous discussion that harvesting inshore apparently does not constitute a threat to the resource. Furthermore, we argued that both federal and provincial governments had actually encouraged entry to the sector as a means of alleviating the chronic unemployment problem within the province.

This in turn suggests that the opportunity cost of much of the labour entering the fishery was and is very low, if not zero. If the opportunity cost of labour entering the fishery is in fact zero, then why should the presence of an excessive number of fishermen in the sector be regarded as anything more than harmless work sharing?

In responding to this question, we commence by considering the mix of the inshore harvest of northern cod. We have observed that cod is harvested inshore primarily by trapskiffs and longliners. It has also been noted that the federal government has shifted from a policy of allowing the inshore sector to catch as much as it is able to establishing a quota for the inshore.¹⁹ Hence, the possibility exists that an increase in the harvests of one inshore gear type could come at the expense of harvests by other inshore gear.

Setting a Course stresses the fact that the easiest point of entry to the inshore groundfishery is the cod trap sub-sector (Newfoundland and Labrador Department of Fisheries (1978a, Vol. IA, 100)). Yet it is in this segment of the northern cod fishery that the problems of seasonality and quality appear in their most acute form (Munro (1980, Chapter 4); NORDCO (1981, Section 4)). Thus, a policy of unlimited entry could lead to biasing the mix of the inshore harvest towards the cod traps.²⁰

Next the argument that the opportunity cost of effort in the inshore sector is low, if not zero, is open to question. First, regardless of what one may care to argue about the opportunity cost of the labour component of additional fishing effort, one can scarcely argue that the opportunity cost of the capital component approaches zero.

With respect to the labour component, cost-benefit specialists with the federal government warn us that the opportunity cost of some parts of the labour component of additional fishing effort may in fact be high. The creation of apparent new employment opportunities in the province may dissuade prospective migrants to more fully employed

regions of Canada from actually moving. Indeed Newfoundlanders who had migrated successfully in the past may be encouraged by the new opportunities to return (see Howe, Monds and Evans (1975)).

Thus the control of fishing effort in the inshore sector is not an issue which can be safely ignored. Let us next consider, then, recent federal policy on this issue and the consequences of the policy.

Following its 1973 decision to exercise greater control over fishing effort in the Atlantic region, the Department of Fisheries and Oceans established a task force to investigate the issue of licensing and limited entry on the Atlantic coast. The report, popularly known as the Levelton report, was published in 1979 (Levelton (1979)). Although it said little about specific fisheries, it did, by implication at least, argue that some form of limited entry was desirable in the Newfoundland inshore groundfishery. (Levelton (1979, 39)).

In spite of the support for limited entry programmes within Fisheries and Oceans Canada, however, little or nothing was done immediately following EFJ. to regulate the flow of fishing effort to Newfoundland's inshore groundfishery. This is perhaps understandable if we recall the lack of provincial enthusiasm for such a program and more importantly recall the state in which the inshore fishery found itself between 1974 to 1976. All thoughts were directed towards restoring the sector. Restricting numbers could be dealt with once the sector was healthy, or so it must have seemed.

In any event, the fortunes of the inshore sector did improve. Catch rates increased as a consequence of stock restorations and prices rose as North America emerged from a period of recession.

The prices of groundfish rose, and in addition prices of species which groundfish fishermen harvested in a supplementary way rose as well. In some cases the increase was dramatic. Perhaps the most striking example was provided by squid. Squid had formerly been regarded as being fit only for bait. During the late 1970s Newfoundland gained access to the Japanese market for squid. Harvesting squid became a very profitable activity.

After 1976, the number of inshore fishermen began to grow rapidly. In late 1978, the federal government responded with what appeared to be vigorous measures. The government announced a freeze on small boat licences in the Newfoundland groundfishery. The specific reason given was the increase in the number of inshore fishermen on the northeast and east coasts of the island. (LeBlanc (1978, 11)).

The action was, however, more apparent than real. A closer investigation reveals that the freeze applied only to vessels over 65 feet LOA, i.e., middle distance vessels (Carroll (1980)). As has already been noted, however, the middle distance fleet accounted for a trivial share of the harvest. Hence, the freeze had little effect. Furthermore, what little effect the freeze did have was diminished the following June when the newly elected Conservative government relaxed part of the freeze (Munro (1980, Chapter 4)).

The consequences of the government's policy, or non-policy, vis à vis the northern cod inshore fishery are revealed by the following table.

TABLE 7

Newfoundland Groundfish Fishermen²¹ and Inshore Harvest of
Cod in ICNAF Divisions 2J, 3K, and 3L, 1973-1979

| Year | Number of Fishermen | Inshore Cod Harvest ('000s of tonnes) |
|------|------------------------|--|
| 1973 | 6,821 | 42.7 |
| 1974 | n/a | 35.2 |
| 1975 | n/a | 41.1 |
| 1976 | 7,915 | 59.9 |
| 1977 | 11,640 | 72.6 |
| 1978 | 16,218 | 79.5 |
| 1979 | 21,083 | 86.7 |
| 1980 | 22,921 | 94.2 |

Source: Courtesy of Statistics and Computer Services Division,
Economic Services Branch, Fisheries and Oceans Canada,
St. John's.

Over the years 1976 to 1979 the Newfoundland groundfish fishermen population 2J3KL grew at an average annual rate of 38.6 per cent.²²

In 1980 severe entry restrictions were imposed which sharply reduced the growth rate.

It is true that the aforementioned rate of growth refers to the number of fishermen. However, Fisheries and Oceans Canada estimates that the number of Newfoundland man years of labour devoted to harvesting groundfish in 2J3KL also grew at an annual average rate of 38-39 per cent per year.²³

One can, of course, argue that the massive increase in the inshore fishing population was necessary to exploit the revived harvest opportunities available to the inshore sector. The inshore harvest 2J3KL cod increased by 57 per cent between 1976 and 1980. Thus one can claim that without the observed 190 per cent rise in the fishing population the aforementioned increase in the inshore harvest would have been impossible. We cannot disprove such an assertion, but we can express serious doubts about its validity.

When a groundfish resource such as northern cod is being restored, the total harvest can be expected to increase even if no increase in fishing effort is forthcoming. This is because of the fact that with a constant level of fishing effort the increasing density should lead to a rise in the catch per unit of effort (CPUE). Thus Fisheries and Oceans Canada projects that the 1985 TAC for 2J3KL cod will be 125 per cent greater than the 1978 harvest assuming that the level and mix of fishing effort remain constant (Canada, Department of Fisheries and Oceans (1980a, 46; 1981, 49)).

It is, of course, dangerous to take the Department of Fisheries and Oceans harvest and CPUE projections for the 2J3KL cod fishery as a whole and apply them to a particular segment of the fishery. There is, however, evidence that the heavy depletion of the 2J3KL cod stock during the 1960s and early 1970s led to sharp declines in the catch rates inshore (Pinhorn (1979, 62)). Thus it would be most surprising if the restoration of the stock complex did not create the potential for a substantial improvement in catch rates.

For what it is worth, the authors of Setting a Course assumed that the catch rate indices projected by federal government could be applied without modification to the longliners exploiting northern cod (Newfoundland and Labrador, Department of Fisheries (1978a, Vol. IA, 105)). They argued, however, that these indices could well understate the potential improvement in the catch rates of the cod traps (Newfoundland and Labrador, Department of Fisheries (1978a, Vol. IA, 99)).

It is also worth noting in passing that Setting a Course in its plans projected that by 1985 the inshore sector would harvest 242,000 tonnes of northern cod annually and that it would be able to do so with fewer than 7,000 full time or bona fide fishermen (Newfoundland and Labrador, Department of Fisheries (1978a, Vol. II, 548; Vol. III, Appendix 4)).

Thus, we are left with the nagging suspicion that the 2J3KL fishermen population explosion between 1976 and 1979 could not in fact be explained away in terms of manpower requirements needed to accommodate restored harvest opportunities. If these suspicions are valid, then it follows that some of the fishermen who poured into the sector after 1976 may have been redundant in the sense that they were harvesting fish, not at the expense of the offshore, but at the expense of other inshore fishermen.²⁴ Indeed we could suggest that between 1976 and 1979 the inshore sector was quite literally out of control.

In 1980 the federal government took action which suggested that it did now believe that the level of fishing effort in the inshore sector had become excessive. In March 1980 the federal government announced a moratorium on "all new entry of vessels of any size using

any type of towed groundfish gear longlines and gillnets in the Atlantic groundfish fishery." The northeast coast of Newfoundland and Labrador were, however, to be excepted (Canada, Department of Fisheries and Oceans (March 14, 1980)). Two months later the ban was extended to otter trawls used by vessels under 65 feet in length along the aforementioned two coasts (Canada, Department of Fisheries and Oceans (May 12, 1980)).

The effect of these two announcements upon the northern cod inshore fishery was to limit further expansion in the longliner fleet off the Avalon peninsula and moderately limit the fleet's activities in the rest of the fishery. What the effect was on the trap fleet is unclear. Traps were not specifically mentioned, but supplementary gear, such as gillnets, used by trap boats off the Avalon peninsula were. In any event the inshore population continued to increase (see Table 7).

Then in June 1980 the federal government announced that there was to be a freeze on the issuance of personal fishing licences throughout the entire Atlantic region. No exceptions were to be made (Canada, Department of Fisheries, June 9, 1980)).

The federal government went on to state that the freeze was being implemented while planning of a more complete and elaborate system of licence limitation was being developed (Canada, Department of Fisheries and Oceans, June 9, 1980). The new system was unveiled in a speech by the minister to the Newfoundland Fishermen, Food and Allied Workers Union (NFFAWU) in November, 1980 (Le Blanc (1980)).

Under the new system, fishermen were to be classified as full time or part time, depending upon their degree of participation in

the fishery. A full time fisherman was to be defined as one who "fishes consistently during the fishing season in his area and has little other income except on a limited basis from such things as farming or logging" (Le Blanc (1980, 3)). When actually applied early in 1981, 11,000 of the 35,000 licenced fishermen in Newfoundland were declared to be full time (Canadian Fishing Report (February 1981, 16)).

The system bears some resemblance to the B.C. salmon licencing program in which vessels (rather than fishermen) were given A or B status depending upon the history of their participation of the program. The B licence vessels were scheduled to be phased out within ten years after the commencement of the program (Fraser (1979)).

In the case of the program which has been applied to Newfoundland (and is scheduled to be applied to the Maritimes as well), there is no explicit intention to remove the "B" fishermen (part timers). On the contrary, Fisheries and Oceans Canada has been insistent that no one would be removed from the fishery (Canadian Fishing Report (February 1981, 16)). It is, however, difficult to escape the conclusion that the authorities intend in fact to eliminate the part timers gradually through attrition.

Part time fishermen wishing to retire from a fishery will be allowed to sell their vessels to actual or prospective participants in the fishery only if the would be purchasers have full time status (Canadian Fishing Report (February 1981, 16)). Furthermore, it is anticipated that new licences will be restricted to those fishermen who have gained full time status (Carroll (1981)).

In addition, part time fishermen remaining in the fishery will be subject to discrimination. An example, is provided by the cod trap fishery. As we suggested earlier cod trap births vary substantially in terms of their productivity. It has been estimated, for example, that, of approximately 4,000 berths in the province, no more than 1,000 can be classified as "prime" (Hood (1980)). In many Newfoundland communities prime births are allocated by lottery. The minister has decreed that henceforth only full time fishermen can participate in the lotteries (Le Blanc (1980, 4)).

In establishing its program, the federal government strove to obtain fisherman support. Local licencing appeal boards were established each with five voting members, four of whom were to be fishermen (Canadian Fishing Report (February 1981, 16)). More importantly, the federal government had obtained the support of the fishermen's union (NFFAWU).²⁵

The views of the NFFAWU on licencing had been made explicit when it presented a brief to the Levelton task force in 1978 (NFFAWU (1978)). The union had argued for a two-tier licencing system to distinguish between professional and non-professional fishermen (NFFAWU (1978)). While the federal government chooses to use the term "full time" rather than "professional," it does, at the same time, talk about its desire to "professionalize" the fishery (Canadian Fishing Report (February 1981, 16)).

The federal government also showed itself to be sensitive to union views on licence transferability. In its brief to the Levelton task force, the union had expressed adamant opposition to licence trans-

ferability on moral grounds. Those who are granted special privileges by the state should not be permitted to profit thereby (NFFAWU (1978)). Under the federal government program a fisherman can transfer his licence, but only to a person who has been his co-worker on a vessel or fishing enterprise for not less than three years. If a fisherman wishes to leave the fishery and can find no acceptable transferee, his licence will be retired. (Canadian Fishing Report (February 1981, 16)).

While the federal government's program appears to have gained union acceptance, it has not been warmly received by the provincial government. The premier is reported to have said that it is very dangerous to interfere with the public right of fishing (Canadian Fishing Report (February 1981, 16)). The Newfoundland minister of fisheries argued that federal government's program was premature in light of the provinces own royal commission on the fisheries currently in progress. Moreover, he expressed alarm at the federal government's apparent intention to restrict the fisheries over the long run to full time fishermen (St. John's Evening Telegram, December 13, 1980).

Given the provincial government's marked opposition to the federal program, it is interesting to observe that Setting a Course put forth proposals for restricting entry to the cod trap sub-sector that were, if anything, considerably more drastic than those being implemented by the federal government. The authors of this document recommended that between the time of writing (1978) and 1985 the entire trap fishery be restricted to bona fide, i.e., full time, fishermen. Moreover, they advocated that restrictions be placed on the number of vessels which could participate in the trap fishery and the number of traps which

each vessel could tend (Newfoundland and Labrador, Department of Fisheries (1978a, 101)). If followed, the proposal put forth by Setting a Course would have resulted in there being one third fewer traps in 1985 than there had been in 1977 and substantially fewer men (Munro (1980, Chapter 4)).

It can be suggested (although not proven) that one reason for the provincial government's apparent change of mind is its rivalry with Nova Scotia. Attempting to maximize the inshore sector's share of the TAC by permitting unlimited entry has the advantage of minimizing the potential Nova Scotia harvest.

In discussing the offshore sector we raised the question of the feasibility of individual harvest quotas. For completeness sake we should do the same for the inshore sector.

Consider first the cod traps. The trap is a wholly inflexible gear bound to a specific location and operational for only a few weeks during the year. Once the trap has been put in place, the catch is determined, to all intents and purposes, by the vagaries of nature. Thus, an individual trap owner could, during a given year, easily be confronted with a harvest far below or far in excess of his allotment.

It is true that one could conceive of this problem being resolved by making the quotas marketable. Trap owners confronted with potential harvests in excess of their allotment could attempt to buy up additional harvest rights through brokers. Let us recall, however, that the number of traps is great, that the traps are widely dispersed and that the season is both very short and intense. Let it also be noted that the trap season is not uniform throughout the province, but varies according to region. It might well be described as a rolling season.

Thus the quota market would have to be intricately organized and run with considerable sophistication if chaos were not to result. It is not at all clear that the game would be worth the candle.

The whole point of individual harvest quotas is to create property rights in the fishery. Given this goal, a far more sensible approach to the trap fishery, in the view of these writers at least, would be to restrict the number of operational berths, and embody property rights in the berths themselves. Restrictions on the number of berths should alleviate the chronic glut problem.

Embodying property rights in the berths has the immense advantage that the association of property rights with berths has long since gained wide acceptance in much of the province. In some communities property rights are seen to reside with families; in others with the community at large (Alexander et al. (1974, 18); Copes (1972, 79)).

When we turn to gillnets tended by longliners the situation is somewhat different. It is true that once the gillnet is set it is a fixed, passive gear. However, there is an element of search and capture in that the longliners have some considerable flexibility in determining the location of their nets and in the number of nets they carry.

Thus, there may be a case to be made for introducing harvest quotas for longliners operating gillnets. Further investigation is required, however, to assess the feasibility of the scheme.

There is finally one question which arises from time to time, namely whether auctionable harvesting quotas could be used as a means for allocating the Newfoundland share of the harvest between inshore and the offshore fisheries. The answer has by now really been provided.

While harvest quotas seem eminently sensible for the offshore, they are exceedingly questionable for use in the cod trap fishery and of uncertain value for longliner-tended gillnets. Hence, the division of the harvest between the two sectors will have to be made by government fiat.

6. Conclusions

The northern cod fishery of Newfoundland is divided into reasonably distinct inshore and offshore sectors. Prior to 1977, the two sectors were subject to separate management. The inshore sector was the responsibility of the Canadian federal government. Management of the offshore sector was the responsibility of the International Commission for the Northwest Atlantic Fisheries, of which Canada was a member.

While the responsibility for management of the two sectors lay with separate bodies, the two bodies were bound by a common management doctrine. The goal of management was seen to be that of managing the resource in such a manner as to achieve MSY. We argued that adherence to the MSY rule by the joint managers of northern cod led, as far as Canada was concerned, to unequivocal economic disaster.

With the advent of Extended Fisheries Jurisdiction, Canada became the sole manager of the northern cod fishery, offshore as well as inshore. The revolution in management was accompanied by a revolution in management philosophy. MSY was formally abandoned and replaced by the concept of optimum sustained yield. While OSY remains ill-defined, it is clear that the authorities recognize the importance of economic (as well as social) factors in managing fisheries such as northern cod. In particular they give explicit recognition to the fact that in all fisheries potential resource rent can be dissipated through the emergence of excess fishermen and vessels.

Upon examining the new management regime, we conclude that the offshore sector is subject to effective management. Fishing effort is

strictly controlled. In part, this reflects the nature of the fishery. The domestic fleet is small in number and can be easily policed.

The one area of weakness in the management of the offshore fishery lies in the fact that fishing companies must compete with one another for shares of the limited offshore quota. Economic waste is the inevitable result. This source of resource rent dissipation could be eliminated by establishing company harvest quotas. The impediments to such a scheme appear to be neither technical nor economic, but rather political.

In contrast, fishing effort in the inshore sector was not subject to effective control until mid-1980. From 1976, when the 2J3KL cod stock began to recover until 1979, the growth of the number of participants was exponential. Indeed we suggested that the inshore sector was out of control.

The system which is being implemented by the federal government does carry with it the promise of reducing the number of participants over time. The process will, however, be very slow and no doubt painful. In retrospect it is clear that the ideal time to have introduced limited entry was in 1975-1976 when the inshore population was unusually low. The inshore population could have been allowed to grow, but on a controlled basis.

We next raised the question as to whether measures should be undertaken to establish property rights in the inshore fishery in the form of individual harvest quotas. We concluded that a system of such quotas applied to the longliner sub-sector (but excluding cod traps) might be feasible, but would require extensive further study. With

regards to the cod trap sub-sector, we have serious doubts about the feasibility of individual quotas and conclude that it would be more sensible to establish property rights in a restricted number of cod trap berths.

FOOTNOTES

¹Any division between offshore and inshore is, of course, arbitrary. Offshore vessels are, by and in the large, 120 feet Length Overall (LOA) or more. Inshore vessels are usually thought to encompass those that are 65 feet LOA or less. As we shall see there is as well a tiny middle distance fleet between 65 and 120 feet LOA.

²It must be recognized, however, that inshore harvests were exceptionally low in 1974 due to severe weather conditions.

³This question is analysed in detail in (Clark (1980)).

⁴Although it was true that in a few of the years post-EFJ catch rates offshore remained favourable after April giving rise to the hope that the offshore season could be extended (Dunne (1979, 88-89)).

⁵Wetfish trawlers are subdivided into side trawlers and the newer stern trawlers. Side trawlers are being gradually phased out. A typical stern trawler would be about 150-175 feet LOA and could be expected to cost \$4.5 million new (1979 dollars) (Canada, Fisheries and Oceans (1979, 48)).

⁶The NORDCO study commissioned by the Newfoundland government argues that the 85 per cent goal could probably be reached in a reasonable manner only by expanding the middle distance fleet and treating the fleet as an extension of the inshore sector (NORDCO (1981, Section 4)).

⁷Thus, for example, fishermen were required to use nets in the cod traps having mesh sizes of not less than 3 1/2 inches. (Newfoundland and Labrador. Department of Fisheries (1977, 14)).

⁸In the post-World War I era the inshore harvest of 2J3KL cod reached a peak in 1934 with a harvest of 245,000 tonnes (Dunne (1979, 79)).

⁹For a description and analysis of the federal subsidy programme see Copes (1972, 65-76).

¹⁰Fisheries and Oceans Canada does, of course, bear no responsibility for the unemployment insurance program.

¹¹There was a built in allowance for the inshore fishery. Recall, however, that the inshore accounted for a very small fraction of the harvest during the early 1970s.

¹²It was admitted in later years that the TACs had in fact been too large (Pinhorn (1979, 59)).

¹³No restrictions were imposed upon inshore harvests Domestic offshore harvests were minor. Hence, the harvests which were reduced were foreign harvests. Thus, it appears that foreigners, not Canadians, were having to endure the sacrifice.

This view is mistaken, however. Once EFJ was an accomplished fact in Canada, the 2J3KL cod resource constituted Canadian property. Canada was in a position, therefore, to enjoy a return, monetary or non-monetary, on foreign harvests of 2J3KL cod. Hence the reduction

of foreign harvests implied a reduction in the current potential benefits which Canada might expect to enjoy from the resource.

¹⁴For a detailed discussion of the political and legal aspects of Newfoundland fisheries policy see (McCorquodale (forthcoming)).

¹⁵If overtime a substantial portion of the offshore harvest were to be taken by a fleet of so-called middle distance vessels, then admittedly the policing problem would become more difficult.

¹⁶The government did allow for expansion of the offshore fleet through replacement. Thus, a wetfish trawler due for retirement could be replaced by a new vessel which was as much as 25 per cent larger. (NORDCO (1981, 54)). In any event, the government did show that it could exercise close control over the offshore fleet.

¹⁷There would still be some incentive for companies to harvest intensively at the beginning of the season in that an individual company would want to take its quota before the stock had been thinned. This problem might be eased by establishing quotas, not on a seasonal basis, but on a month by month or even week by week basis.

¹⁸Distant water nations could be accommodated simply by putting aside a quota reserve for them.

¹⁹If one examines the inshore quota in Table 6, it could be argued that it is so large that it constitutes a non-binding constraint on the inshore sector. That could well be true for the 1981 season but there is no assurance that the constraint would continue to be non-binding in the future.

²⁰Gillnets are a more selective gear. If the nets are tended properly they will yield fish that are larger and of better quality than those taken on average in the traps. (Munro (1980, Chapter 4); NORDCO (1981), Section 4)).

²¹Trawler fishermen are included, but they account for a miniscule fraction of the total (Russell (1980)).

$$^{22}\text{Average Percentage Rate of Growth} = \left\{ \left(\frac{21,083}{7,915} \right)^{1/3} - 1 \right\} \cdot 100 = 38.6\%.$$

²³Information courtesy of Statistics and Computer Services Division, Economic Services Branch, Fisheries and Oceans Canada, St. John's.

²⁴We have encountered the assertion that the CPUE in the inshore sector has not increased (Hood (1980)). If redundant fishing effort emerges in a fishery while the fishery is being restored, then it is very likely that the perceived CPUE will not increase.

²⁵Newfoundland Fishermen, Food and Allied Workers Union.

REFERENCES

- * Alexander, D. et al. (1974). Report of the Committee on Federal Licensing Policy and Its Implications for the Newfoundland Fisheries. St. John's: Memorial University of Newfoundland.
- Beckett, J.S. (Senior Policy / Program Advisor, Canada Department of Fisheries and Oceans)(1980, 1981) personal communication.
- Brothers, G. (1975). Inshore Fishing Gear and Technology. St. John's, Department of the Environment, Fisheries and Marine Service, Industrial Development Branch.
- Canada. Department of Fisheries and the Environment (1976). Policy for Canada's Commercial Fisheries.
- Canada. Department of Fisheries and Oceans (1980). News Release. March 14.
- * Canada. Department of Fisheries and Oceans (1980). News Release. May 5.
- * Canada. Department of Fisheries and Oceans (1980). News Release. September 6.
- * Canada. Department of Fisheries and Oceans (1979). Canada's East Coast Fleet Development to 1985: Rationale and Strategy: n.p.: mimeographed.
- Canada. Department of Fisheries and Oceans (1980a). Resource Prospects for Canada's Atlantic Fisheries 1980-1985.

Canada. Department of Fisheries and Oceans (1980b). Annual Statistical Review of Canadian Fisheries.

* Canada. Department of Fisheries and Oceans (1980c). 1981 Atlantic Groundfish Management Plan: n.p.: mimeographed.

* Canada. Department of Fisheries and Oceans (1981). Resource Prospects for Canada's Atlantic Fisheries 1981-1987.

* Canadian Fishing Report. Various Issues.

Carroll, J.W. (Executive Director of Licensing and Regulations, Atlantic, Canada. Department of Fisheries and Oceans) (1980, 1981) personal communication.

* Clark, C.W. (1980). Concentration Profiles and the Production of Marine Fisheries. Vancouver: University of British Columbia Institute of Applied Mathematics and Statistics Technical Report No. 80-8.

Copes, P. (1972). The Resettlement of Fishing Communities in Newfoundland. Ottawa: Canadian Council on Rural Development.

* Dunne, E.B. (1979). The Canadian 2J + 3KL Cod Fishery -- Recent Trends and Future Prospects in Department of Fisheries and Oceans, Northern Cod Seminar: Final Report.

Ferris, S. and C. Plourde (1980). Fisheries Management and Employment in the Newfoundland Economy. Economic Council of Canada, Discussion Paper No. 173.

- * Fraser, G.A. (1979). Limited Entry: Experience of the British Columbia Salmon Fishery. Journal of the Fisheries Research Board of Canada, 36: 754-763.
- Gulland, J.A. (1974). The Management of Marine Fisheries. Seattle: University of Washington Press.
- Gulland, J.A. and L.K. Boerma (1973). Scientific Advice on Catch Levels. Fishery Bulletin, 71: 325-335.
- * Haché, J.C. Director of Resource Allocation -- Atlantic Region, Canada. Department of Fisheries and Oceans) (1981) personal communication.
- * Hood, P. (Canada. Department of Fisheries and Oceans, Economics Services Branch, St. John's) (1980) personal communication.
- Howe, J., K. Monds and J.E. Evans (1975). On Estimating the Social Opportunity Cost of Labour for the Gull Island Hydro Project and for Alternative Generation Facilities in Newfoundland. Canada. Department of Industry, Trade and Commerce.
- * International Commission for the Northwest Atlantic Fisheries (ICNAF) (1978) Redbook.
- * Le Blanc, R. Minister of Fisheries (1978). Notes for a speech to the Newfoundland Fishermen, Food and Allied workers Union: December 4. St. John's: Canada. Department of Fisheries and the Environment.
- * Le Blanc, R. Minister of Fisheries and Oceans (1980). Notes for an address at the NFFAWU annual meeting: November 12: St. John's: Canada. Department of Fisheries and Oceans.

Levelton, C.R. (1979). Toward an Atlantic Coast Commercial Fisheries Licensing System. Report prepared for Canada Department of Fisheries and Oceans.

X McCorquodale, S. (forthcoming). A question of fisheries management policy in Atlantic Canada in M. Atkinson and M. Chandler (eds.). Canadian Public Policy: A Comparative Approach. Toronto: University of Toronto Press.

McCracken, F.D. (1975). Anticipated state of the stocks in Canada. Department of the Environment, Fisheries and Marine Service, Canadian Fisheries 1975.

X May, A.W. et al. (1980). Management of Canadian Cod Stocks. Canada. Department of Fisheries and Oceans. Paper prepared for joint session of the Fish Committees at the ICES annual meeting: n.p., mimeographed.

Munro, G.R. (1980). A Promise of Abundance: Extended Fisheries Jurisdiction and the Newfoundland Economy. Ottawa: Economic Council of Canada.

Munro, G.R. (1977). Canada and fisheries management with extended jurisdiction: a preliminary view, in L.G. Anderson (ed.). Economic Impacts of Extended Fisheries Jurisdiction. Ann Arbor: Ann Arbor Science.

Newfoundland Fishermen, Food and Allied Workers Union (NFFAWU)(1978) Submission to the Levelton Committee. St. John's.

* Newfoundland and Labrador (1980). Managing All Our Resources: A Development Plan for Newfoundland and Labrador 1980-1985.

Newfoundland and Labrador. Department of Fisheries (1978a). Setting a Course: A Regional Strategy for Development of the Newfoundland Fishing Industry to 1985.

Newfoundland and Labrador. Department of Fisheries (1978b). Primary Landing and Distribution Centre: Feasibility Study Report.

Newfoundland and Labrador. Department of Fisheries (1977). A study of the seasonal inshore codtrap fishery glut. St. John's. Mimeographed.

* Newfoundland Oceans Research and Development Corporation (NORDCO) (1981). It Were Well to Live Mainly Off Fish: The Place of the Northern Cod in Newfoundland's Development. A report prepared for the government of Newfoundland and Labrador.

Pinhorn, A.T. (1976). Living Marine Resources of Newfoundland-Labrador. Fisheries Research Board of Canada Bulletin No. 194.

* Pinhorn, A.T. (1979). The northern cod resource in Canada. Department of Fisheries and Oceans, Northern Cod Seminar: A Final Report.

Russell, R. (Canada Department of Fisheries and Oceans. Economic Services Branch. St. John's)(1980) personal communication.

* St. John's Evening Telegram. (*various years*)

Schrank, W.E., E. Tsoa and N. Roy (1980). The Relative Productivity and Cost-Effectiveness of Various Fishing Techniques in the Newfoundland Groundfishery. Economic Council of Canada. Discussion Paper No. 180.

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