

Policy issues, and challenges in Canadian management of the Atlantic fisheries

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Summary

Despite steady injection of public funds by successive administrations, the Canadian fishery industry is characterized by resource depletion, vessel tie-ups, and overcapacity, which have led to plant closures and rising unemployment. This paper assesses the progress Canadian marine policies have been making towards rational use and conservation of fisheries and promotion of employment and economic development in fishing communities since 1977.

The analysis begins with the creation of the 200-mile exclusive economic zone (EEZ) and its rationale in the United Nations Convention on the Law of the Sea (UNCLOS), namely conservation. State subsidies for fleet upgrading, industry modernization, marketing, and the introduction of quota systems, such as the individual transferable quotas (ITQs) and enterprise quotas (EQs), are identified as the key policy initiatives which might realize an economically-viable fishing industry in the post-1977 period. These policies produced corporate expansion and prosperity in the mid-1980s, but there followed corporate losses because of Canadian over-dependence on American markets and sharp quota cuts.

With regard to conservation, shortcomings are identified in the virtual population analysis model (VPA), and the inability of the Department of Fisheries to monitor fishing effort by domestic and foreign vessels. The need for radical change in the future direction of marine policies is emphasized and arguments made which support the following objectives: elimination of ecologically-harmful fishing technologies; use of community quotas (with a modified individual quota system); strengthening of community management systems and development of co-management approaches to fisheries management, involving government and fishing communities.

Keywords: fisheries, conservation, sustainability, common-property, co-management, quotas

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Introduction

Canada, along with many other nations, proclaimed a 200-nautical mile exclusive economic zone (EEZ) in 1977, bringing the bulk of its offshore fisheries resources under national control. It is now common knowledge that this extended jurisdiction is rooted in the United Nations Convention on the Law of the Sea (UNCLOS); that the authority has been granted to coastal states to ensure proper management and conservation of marine living resources (United Nations 1982, 1994).

It seems reasonable, after roughly two decades of active involvement in fisheries matters, to assess what progress Canada has been making towards ensuring the rational use of marine living resources. What challenges and opportunities are discernible from the efforts of the Canadian Government to discharge the responsibility for sustainable development of fisheries within its EEZ? To what extent can success or failure in fisheries management be attributed to the nature of Canadian marine policies? Answers to these broad questions of policy effectiveness will be discussed under two major issue areas of particular relevance to understanding the scope and limits of Canadian fisheries management effort, namely rehabilitation and enhancement of fisheries resources, and employment and national economic development.

Canada has experimented with various innovative management institutions for the development of its ocean fisheries. Analysis of Canadian experiences, including policy successes and failures, should be of benefit to researchers interested in studying comparable fisheries management efforts elsewhere, in the industrialized West and the Third World.

Overview of policies and underlying principles

Following UNCLOS, what emerged most clearly from the development of Canadian marine policy was the determination to strengthen international support for the protection of its coastal marine environment (Coull 1984; Meyboom 1990; Tobin 1995), while constructing new management measures for promoting the economic viability of domestic fishing operations. Under the auspices of the Northwest Atlantic Fisheries Organization (NAFO), Canada initiated a series of bilateral negotiations with distant-water fishing nations which produced agreements on the actual terms of foreign participation in the exploitation of fisheries resources

inside its exclusive economic zone. Part of the new bilateral agreements allow licensed access to fishing in Canadian waters in return for market access in the countries concerned; distant-water nations who fish 'responsibly', by complying with regulations on conservation of straddling stocks, are rewarded with increased allocations of fish from surplus stocks within the exclusive economic zone (Pinhorn & Halliday 1990; Emery 1994).

Concerning the promotion of a commercially-viable domestic fishing sector, the direction of practical government initiatives has been guided by the recommendations of the Task Force on the Atlantic Fisheries that was established in 1982 (Kirby 1983; Barrett & Davis 1984). It proposed three major objectives for the management of fisheries in this order of priority: (1) the Atlantic fisheries industry should be economically viable on an ongoing basis, where to be viable implies an ability to survive downturns with only a normal business failure rate and without government assistance. (2) Employment in the Atlantic fishing industry should be maximized subject to the constraint that those employed receive a reasonable income as a result of fishery-related activities. (3) Fish within the 200-mile Canadian zone should be harvested and processed by Canadians in firms owned by Canadians. In pursuit of these objectives, the government embarked on an extensive economic restructuring plan which included the consolidation of five medium-size firms into two fishing conglomerates, namely Fishery Products International and National Sea Products. While smaller user groups and individual fishers were encouraged to upgrade their boats and equipment through special business loans, the corporate sector was the major beneficiary of massive injections of public funds in the form of government shares, officially guaranteed commercial loans, and several liberal financial subsidies (Department of Fisheries and Oceans 1987, 1990; Neher *et al.* 1989). Accompanying these economic initiatives was the development of innovative management techniques for controlling the exploitation rate of fisheries (Arnason 1992; Parsons 1993). Detailed annual management plans continue to impose lower catch levels to permit quick recovery of fish stocks, and mesh-size restriction is currently applicable to almost all fisheries of Atlantic cod, haddock, and flatfish. In addition, limited-area-licensing, individual transferable quotas, and enterprise quotas constitute a new configuration of rights-based (Neher 1992; Emery 1993) management systems for ensuring the emergence of a Canadian fishing industry that would be economically viable, internationally competitive, and profitable (Task Force on Incomes and Adjustment in the Atlantic Fishery 1993).

Commitment to rational management, protection, and enhancement of the marine environment is re-stated in the Canadian Fisheries Act (Government of Canada 1993), which provides the legal basis for enforcement activities of the Department of Fisheries. Section 34 of this document (Fisheries Act: Amendment List RSC; Government of Canada 1993) refers explicitly to 'Fish habitat protection and pollution prevention.' It prohibits the introduction of any

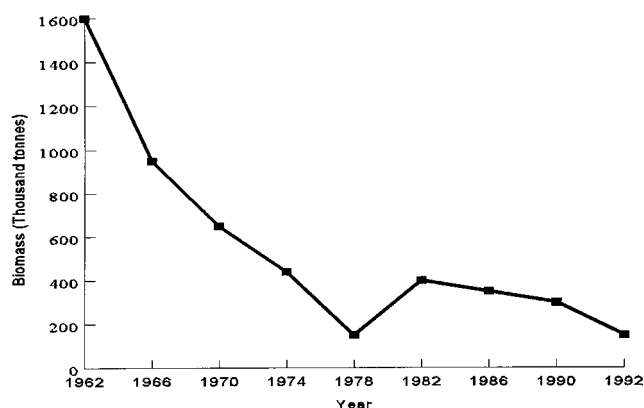


Figure 1 Northern Cod spawning biomass 1962–1992 (Age 7 and over), adapted with modifications from NAFO Statistical Bulletins (Northwest Atlantic Fisheries Organization 1979–1992).

substance that would degrade or alter the quality of water so that it is rendered, or is likely to be rendered, deleterious to fish or fish habitat or the use by man of fish that frequent that water. Concerning the regulation of fishing effort, section 43 of the Fisheries Act (Government of Canada 1993) implores all users of Canadian fisheries to comply with national laws respecting the use of fishing gear and equipment, conservation and protection of spawning grounds, the manner in which information shall be provided with regards to catching, disposal, and export of fish.

Conservation and rehabilitation of fisheries resources

In measuring the degree to which management plans meet conservation objectives, it is appropriate to evaluate the condition of fish stocks, in particular the over-fished resources that have been the subject of intense rebuilding and rehabilitation efforts. Although the principal management objectives have been to maintain the resource base of fisheries and to ensure sustainable utilization of living marine resources, since 1976 there has been steady and drastic decrease in the abundance of several key Atlantic groundfish stocks, including the important northern cod stock. The spawning biomass of northern cod declined from 1600 thousand tonnes in 1962 to roughly 150 000 t in 1978 (Fig. 1). After achieving modest growth levels in the 1980s, the precipitate fall towards stagnant or negative growth in spawning biomass prompted the Canadian Department of Fisheries and Oceans (DFO) to declare a 'conservation ceiling' in 1992, temporarily shutting down the offshore cod fishery inside the 200-mile limit. Sharp reductions in quota allocations also followed a retrospective report (Department of Fisheries and Oceans 1994; Emery 1994; North Atlantic Fisheries Organization 1994) about declines in the total biomass of Greenland Halibut (Turbot) stocks, from slightly more than 200 000 t in 1984 to 50 000 t in 1993 (Fig. 2). Productivity in Greenland Halibut stocks of spawning age has also been negligible in the last four years (Fig. 3).

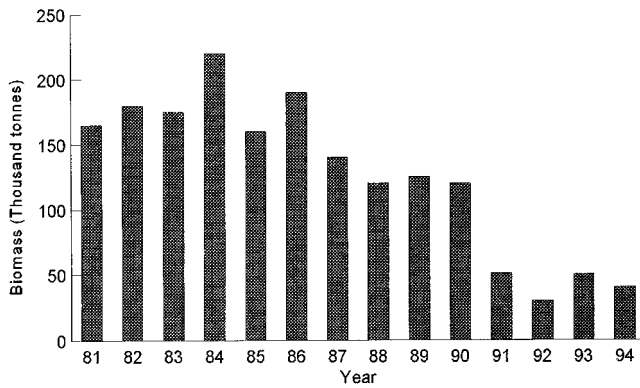


Figure 2 Decline of Greenland Halibut biomass inside 200-mile limit, adapted with modifications from NAFO Statistical Bulletins (Northwest Atlantic Fisheries Organization 1981–1994).

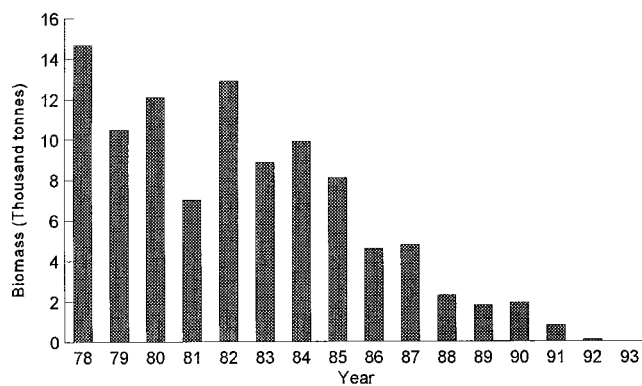


Figure 3 Decline in Greenland Halibut of spawning age inside 200-mile limit, adapted with modifications from NAFO Statistical Bulletins (Northwest Atlantic Fisheries Organization 1979–1993).

The first important factor contributing to the decline in the abundance of many of the stocks is linked partly to fundamental weaknesses in the stock assessment models used by the Canadian government to manage fish stocks within the 200-mile exclusive economic zone. The model most commonly used by Canadian fisheries managers to assess groundfish stocks, namely virtual population analysis (VPA), frequently assumes steady-state equilibrium in the natural condition of fisheries (Task Force on Newfoundland Inshore Fisheries 1987; Task Force on the Scotia-Fundy Groundfish 1989; Hurley & Gray 1994), and it downplays the effects on fish productivity of changes in oceanic variables such as water temperature, salinity, currents, and ice coverage (Harris 1990). In setting fish quotas, the VPA model also relies on catch data which are derived largely from commercial fishers, who commonly exceed their quotas and falsify records by under-reporting their catches in order to evade detection. They are also induced to 'high grade' (Pearse 1991) their catch by discarding juvenile fish and catches which they consider to be of lesser quality. For example, between 1988 and 1992 about 868 000 t of fish were discarded annually in the Northwest Atlantic fisheries alone (Myers 1992, 1995; Food and Agricultural Organization of the United Nations 1995). Although the effects of evasive reporting have been well

documented (Furlong 1991; Commission of the European Communities 1992; Crowley & Palsson 1992; Arai 1994), and the contributions of oceanic variables to declines in the total biomass of fish stocks are well known (Copes 1986; Myers 1992; Tsoa 1996), the VPA model scarcely utilizes such information in estimates of stock strength and calculations of total allowable catches. Failure in this regard contributes to incorrect estimates of fish mortality and optimistic predictions of the future abundance of stocks (Harris 1993; Lane & Palsson 1996; Roy 1996). The DFO (Cameron 1990; Department of Fisheries and Oceans 1993) admitted in 1988 that estimates of the size of fish stocks had been very wrong, and it cut the 1988 quota for northern cod from 266 000 t in 1988 to 235 000 t in 1989, 197 000 t in 1990, and 120 000 t in 1992. Even then, current analysis of biological trends in the fishery strongly suggests that catch levels remain unjustifiably high; that given the effects of fishing pressure, the total allowable catch for 1989 should have been 125 000 t, and there should have been much lower quotas for subsequent years. In effect, poor data quality of the VPA model reduces the accuracy of fisheries management predictions, effectively enhancing the dilemma of overfishing and further depletion of the species involved.

Furthermore, the DFO has been unable to adequately monitor the fishing effort of domestic fishers and to enforce new environmental regulations especially on local companies, whose fleet of modern draggers expanded steadily from 1980 onwards. Whereas the government recognizes the effects of the unselective harvesting methods of modern dragger fleets, and the damage to habitat associated with dragging the ocean bottom, proposed modifications to the use of ecologically-harmful fishing technology have not been effected. In this connection, management's ineffectiveness has been a significant contributing factor to the deteriorating condition of Canadian fisheries in the Gulf of St Lawrence, along the south coast of Newfoundland, and the whole length of the Labrador coast from Cape Chidley to the Strait of Belle Isle. In Labrador, where the annual catch for cod stocks was estimated at 94 000 t before the advent of dragger fleets, the spawning ground has been depleted to the point of commercial extinction; the snow crab quota, set at the level of 16 million pounds in 1994, was overfished by 272% (Myers 1995). In Scotia Fundy fisheries the stocks of cod, pollack, and haddock are in danger of outright collapse, the result of 'growth overfishing' (Hall 1990), a level of fishing at which almost all the natural increase in a fish population is captured, undermining ecological diversity and growth in fish biomass.

Overfishing of straddling fish stocks at the Grand Banks by foreign fleets is frequently cited as a major factor contributing to the depletion of fish stocks within Canada's EEZ. For example, government estimates indicate that the European Union (EU) exceeded its quota by 60 000 t in 1990 (Oceans Institute of Canada 1990; Fisheries Resource Conservation Council 1993). Between 1986 and 1992 EU fleets, mainly those from Spain and Portugal, reportedly netted stocks of cod, flounder, and redfish totalling 590 000 t,

which represented four times the quota of 120 000 t allocated to the EU for the fishing period (Emery 1994).

Evidently, the need to conserve over-fished straddling fish stocks, in particular the Greenland Halibut (Turbot) stock, and disagreements amongst participating fishing nations on management targets, forced Canada to amend its Coastal Fishing Protection Act (Government of Canada 1993, 1994, 1995), permitting enforcement action against defaulting distant water fishing nations. Thus the Spanish trawler, *Estai*, which had been 'illegally' fishing on the Grand Banks, was intercepted on the high seas, seized and detained in St John's, Newfoundland, by Canadian authorities (Christopherson 1996).

The legal and diplomatic implications of Canada's unilateral action have been widely discussed (International Court of Justice 1995; Mack 1996). However, it is an assessment of the effect of foreign over-fishing that concerns this study. Although foreign over-fishing poses a real threat to the sustainable and rational use of fisheries, it constitutes only part of the principal explanation for the malaise of declining fish stocks in Canadian waters. Other significant contributing causes may be found in the Canadian management strategy which encouraged over-expansion of domestic fishing capacity in the 1970s and early 1980s (Day 1995), and in faulty scientific forecasts which led to over-estimation of the abundance of fish stocks (Sullivan 1989; Gomes *et al.* 1991). Climate-related fluctuations of recruitment, and an increase in the predation on baby cod by harp seals, constitute additional natural causes of the decline in the abundance of fish stocks in Canadian fisheries (Hayashi 1994).

In view of the condition of Canadian fisheries, it can be concluded that the objectives of 'biological conservation' are yet to be fully met. Urgent corrective adjustments in conservation measures are needed to accommodate environmental variables and to control the ecologically-harmful practices of fishers and other users of Canada's marine environment.

Employment and economic development

Following the recommendations of the Atlantic Task Force, the Government of Canada introduced the Atlantic Fisheries Act 1983, in which it is stated that the major objective of restructuring fisheries enterprises is 'to facilitate the development of viable Atlantic Fisheries that are competitive and privately-owned (Government of Canada 1983). 'Restructuring' is seen as the orderly re-organization and re-financing of a group of insolvent or nearly insolvent companies with the objective of creating new enterprises which have a good chance of long-term viability. For this purpose, the assets of five companies were combined to form two major fishing conglomerates, namely National Sea Products of Halifax (NSP) and Fishery Products International of Newfoundland (FPI). Federal Government financial intervention in the newly re-configured companies took the form of equity injections and direct capital investments which amounted to about \$246.37 million Canadian

dollars (C\$) between 1983 and 1986 (Parsons 1993). According to annual reports to Parliament on the Atlantic Fisheries Restructuring Act, government expenditures by the end of the fiscal year 1985-1986 stood at C\$167.575 million (Fishery Products International) and C\$44.3 million (National Sea Products); C\$31.5 million went into purchasing the assets of another insolvent Quebec fishing cooperative, *Pêcheurs Unis* (Government of Canada 1988).

The government identified the 'common property' (Acheson 1990; Clark 1981; Scott & Neher 1981) character of marine resources and a resultant over-capacity in the harvesting and processing sectors as the primary structural constraint on the prospect of developing a commercially-viable fishing industry; that attempts to control fishing effort by means of limited-entry-licensing schemes seldom eliminate the economic and ecologically-harmful effects of a free-for-all race for fish amongst user-groups. The race for fish, government argues, accentuates the seasonal glut in the fishery industry, adds pressures on markets, and increases the volume of resources that can be efficiently handled by fishing vessels and processing plants. Diminishing returns on investment also set in when fish-processing plants, built to handle peak capacity, are rendered idle, or operate at reduced capacity, during periods of economic turn-down (Matthews 1993). This is the controversial and much-debated (Bromley 1991; Hinds 1995) economic problem of fisheries conservation, referred to as the Great Law of Fishing (Graham 1949); elsewhere, and later, it was called the Tragedy of the Commons (Hardin 1968).

Emphasizing that quota licensing, which provides individual fishers and enterprises with quasi-private property rights to harvest a definite quantity of fish, would eliminate the competitive escalation of fishing power and over-concentration of capital inputs which drive up operational costs, official restructuring efforts in Canadian fishing industry were accompanied by the introduction of enterprise quotas. Almost 50% of the total available fish quotas in Eastern Canada were granted to the newly re-configured companies who were also encouraged to concentrate their fishing effort in offshore fisheries. The remaining 50% of fish quotas were given to the independent small-boat sector, in the form of individual quotas (IQs) or individual transferable quotas (ITQs), which specify the quantity of fish allocated annually to either a person or fishing vessel.

It was also acknowledged that the small-boat sector engages 13-17 thousand vessels. However, although the small-boat sector constitutes 98% of the entire commercial fleet of the Atlantic fishery, and provides 85% (Anderson 1979; Davis & Kasdan 1984) of all commercial fishing employment, the small-boat sector has been constantly saddled with financial problems. The income of fishers remained very low and insufficient to acquire new gear and to maintain adequate working capital. Thus, Fishing Vessel Assistance and Fisheries Improvement Loans (Department of Fisheries and Oceans 1994; Schrank *et al.* 1995) were introduced to ensure fleet upgrading and the enhancement of income/employment

in this sector. On the marketing side, the government was instrumental in negotiating the formation of fish-exporting organizations to cope with fragmentation of efforts; the Atlantic Fisheries Marketing Commission was also established, partly to offer support services to fish exporters.

Federal intervention was the major significant booster to NSP's diversification programmes introduced in the 1987–1988 business plan period: in addition to purchasing controlling shares (65%) in Pacific Aqua Foods of British Columbia, NSP quickly expanded its operations in Europe by purchasing Bretagne Export and Surgelation Lorientaise, both located in France. In pursuit of modernization, the company added more powerful vessels to its fleet, completed a fresh-fish-processing plant in Louisbourg, and acquired Canada's first Atlantic coast factory freezer trawler in January 1986 (National Sea Products 1989; Government of Canada 1985). During the same period, between 1985 and 1987, FPI also invested \$ 90 million in upgrading its fleet and modernization of port facilities (Fishery Products International 1994).

These bold efforts in the development of business plans yielded fruits. As reflected in the company's Annual Reports (National Sea Products 1984–1996), NSP reported a net operating income of C\$ 7.2 million in 1985 which increased to C\$ 21.8 million (1986) and C\$ 27.6 million (1987). The estimates of increases in the net operating income for FPI were C\$ 22.8 million in 1986 and C\$ 31 million in 1987 (Fishery Products International 1994). Regarding the inshore/independent small-boat sector, government financial assistance programmes and subsidies also facilitated significant change in fishing techniques: some of the independent fishers who invested their loans in the purchase of more powerful boats also began to earn relatively higher incomes (Davis & Kasdan 1984; Parsons & Lear 1993; Lamson 1994).

However, the rising economic benefits of the mid-eighties were short-lived, as the structural problems which had led to the 1981–1983 fishery crisis began to re-emerge towards the end of 1988. First, at the level of external demand, the United States market, which accounted for 51% of Atlantic Canadian fish exports worth C\$ 1.6 thousand million in 1981 (Kirby 1983), was consuming 20% more Canadian fish in 1987 than it did in 1983. By 1988 Canadian fish exports faced severe competition from Alaskan pollack and several other species that had become available on a year-round basis from US waters, and had become accepted by domestic consumers as substitutes for traditional groundfish supplies from Canada. American demand for Canadian fish exports began to drop by a substantial 7% (Government of Canada 1990*a*) per annum and this partly explains the deteriorating financial fortunes of NSP which began to record operational losses of C\$ 5.8 million (1988), C\$ 32.4 million (1989), C\$ 7 million (1991), and C\$ 6.1 million (1992). The trend in losses was similar for FPI: C\$ 22.9 million (1989), C\$ 1.5 million (1991), C\$ 3.5 million (1992) (Fishery Products International 1990; Parsons 1993). While export prices and earnings reached record highs between 1985–1988, the risk of Canadian over-

dependence on a precarious American market was largely ignored, as the government invested C\$ 50 million in the Atlantic Fisheries Marketing Commission to enhance support services to fish exporters. A more prudent marketing programme should have taken into account the need for controlled and orderly expansion in its harvesting and processing capacity, directing scientific research effort towards the diversification of product lines and development of alternative markets.

Problems emerging from a sharp shrinkage in Canada's fishery resource base also generated additional negative economic force, driving the recent cycle of economic crisis. In the preceding section of this paper, it was indicated that inaccurate estimates of fish stocks had given rise to the setting of unjustifiably-high allowable catch levels. By late 1989, it was apparent that fishing capacity was about four times the level required to harvest the available resources economically, and the government response to this resource problem took the form of sharp reductions in the total allowable catches for key stocks of haddock and pollack, including a two-year moratorium for northern cod. Official control measures were, however, introduced in panic, and their effect in stemming the downward trend of economic performance in the fishery industry was minimal.

The effects of reduced catch levels, or cuts in quotas, can be seen in the immediate consequences of rationalization measures which were introduced by the two major fishing companies to absorb the shocks of over-capacity and declining earnings. Facing significant reductions in their quotas, estimated at about 43 000 t for each company, both NSP and FPI sought to reduce costs through rotating layoffs, plant shut-downs, and permanent retirement of vessels. The result of these measures has been the loss of employment for about 30 000 people (Government of Newfoundland and Labrador 1992; Schrank *et al.* 1992).

In May 1990 the government responded to the problem of economic dislocation and unemployment by introducing the Atlantic Fisheries Adjustment Programme worth C\$ 1.9 thousand million. According to the Ministry of International Trade, this social rescue package will support individuals and communities to adjust to the realities of declining fish stocks and plant closures. The following amounts were also announced for the development of other components of the adjustment programme: rebuilding of fish stocks: C\$ 150 million, industrial adjustment service: C\$ 130 million, economic diversification: C\$ 146 million (Government of Canada 1990*b*). But government intervention in this regard provides little relief for fishing communities in the coastal provinces of Nova Scotia and Newfoundland, where there is a lack of alternative employment for fishers and fishery plant workers. In particular, it has failed to pacify those 19 000 independent small-boat fishers displaced from productive work, following the dramatic closure of the Newfoundland and Labrador inshore fisheries in 1992. Many displaced fish-processing-plant workers and trawlermen in Newfoundland, Prince Edward Island, New Brunswick, and Nova Scotia continue to depend

on government income support programmes (Government of Canada 1996).

As frustration deepens, almost every component of the adjustment programme is subjected to microscopic re-evaluation by a growing number of critical fishers associations and trade union groups: the initial emergency assistance plan of this adjustment programme, which offers increases in the income replacement benefits of northern cod fishers and plant workers, is condemned as a form of paternalism that will accentuate community dependence on government transfer payments and subsidies (Department of Fisheries and Oceans 1992). The variety of alternative skills development programmes, which includes plans to retire licenses from thousands of small-boat fishers, are seen as administrative devices aimed at eliminating the small-scale fish-producing sector. Fishers' associations believe that this sector is perceived by some bureaucrats to be organizationally fragmented, technologically deficient, and therefore incapable of operating successfully in a free-market environment (Barrett & Davis 1984; Davis & Kasdan 1984). Thus, despite the large expenditure of public funds by the Canadian Government, not much has been achieved in terms of ensuring the expansion of employment in Canadian fisheries that had been expected to be self-sustaining and commercially viable in the 1990s. Indeed, the Canadian fishing industry remains one that is characterized by resource depletion, vessel tie-ups, and over-capacity, which has led to plant closures and rising unemployment.

Conclusions, with a review of proposed reforms in Canadian fisheries management

The determination to implement a fundamental restructuring of the Atlantic fishery industry seemed clearer in 1983, when the Canadian Government adopted the three objectives proposed by the Task Force on Atlantic fisheries, namely economic viability, maximization of employment and indigenization of Canadian fisheries. The corporate sector, that secured generous government subsidies and the bulk of the total allowable catches through the enterprise allocations, proceeded to reap the financial benefits accruing to them from the production and marketing of marine resources. As low world oil prices held operating costs down, the economic fortune of the major fish corporations was largely enhanced by a depressed Canadian dollar which made fish exports cheap in the United States market. But, beginning from mid-1988, consistent decline in the demand for Canadian fish in the United States market, and sharp cuts in total allowable catches of fish stocks, were two important factors that combined together to set the stage for the current fishery crisis that continues to deepen in the 1990s.

Concerns about the fluctuating economic fortunes of the Canadian fishing industry, and the deteriorating condition of fisheries, have encouraged lively debates (Sherman 1989; Eames & Lamson 1993; Elferink 1993; Dyer & McGoodwin 1994; Felt 1994) aimed at redefining the role of government

in fisheries matters. From these, three broad complementary proposals for the future management of Canadian fisheries can be distilled.

(1) Those who propose a 'total ban on draggers' want a drastically limited role for government in the management of fisheries. This is the view of environmental activists and conservationists who are very strident in their criticism of the government's modernization/pro-corporate policies that have led to the expansion of dragger fleets in Canadian waters. At issue is the urgency of preserving the marine environment and fisheries, in the light of ecologically-harmful effects of modern fishing technology. In the view of many conservationists (Heffernan 1989), elimination of sophisticated fishing techniques, and their replacement by proven ecologically-acceptable traditional techniques of fishing by means of anchored nets and baited hooks, will be a first step towards ensuring the protection and enhancement of marine-living resources. Extreme positions prefer more immediate substitution of the entire enterprise of industrial fishing for the production, or domestication, of fish through aquaculture.

(2) At another level, a coalition of small-boat fishing associations and fishery economists support elimination of the enterprise quota system which is seen to have created a hierarchy of privileged fishers, giving corporate licence-holders preferential access and proprietary title to fishery resources. A new management system capable of ensuring equitable access and distribution of resources is one that would be built on well-defined 'fishing districts,' to be managed directly by fishers themselves. Each fishing district would be allocated limited-entry-licenses to be distributed amongst individual users and groups engaged in competitive fixed-gear fishing. This is essentially the concept of 'community quota,' as opposed to enterprise quota. This concept has been elaborated by Troadec (1983), the World Bank (1993) and Hurley and Gray (1994). Promoters of the idea of a community-quota system want a fresh start on a restructuring plan that would include a new programme of subsidies and financial support for small boat fishers, permitting them to expand their harvesting operations and to assume equity positions in community-operated fish-processing plants (Panayotou 1983; Johnston 1992; Organization for Economic Cooperation and Development 1993). Arguing that the estimated dollar value of government financial support for the development of community-based fishery need not exceed the amount of public funds invested in corporations, proponents of change believe that it would break the cycle of dependence, making the small-boat fishing sector less vulnerable to price manipulations by the dominant corporations. It is also expected to reduce the race for fish which leads to a seasonal glut of resources, over-capacity, and reduced income for fishers.

(3) One variation on this concept of community quota is the proposal for 'co-management' of fisheries resources between the government and fishing communities. Co-management underlines the political claims of traditional fishing communities to share power and responsibility with the government. Proponents of co-management contest the

philosophical underpinnings of Hardin's (1968) common-property model, one that informs the direction of government policies in Canada and elsewhere: namely, that all fisheries not regulated by government are doomed to the tragedy of overexploitation. To the contrary, it is argued that some fishing communities have demonstrated the capacity to control the pressures on fish stocks through practices such as establishment of territorial rights and informal agreements on catch limits. In effect, that tragedy of the commons is not inevitable and cannot be generalized. They suggest that the proper role of government in this connection should be to recognize and promote communal-management systems, partly by sharing scientific information that will strengthen the traditional management regimes towards realizing the full objectives of sustainable fisheries development (Berkes 1989; McCay & Acheson 1990).

Some of the hypothesized merits of this joint management approach include, 'a greater commitment to success by fishers who play an active role in the design of management strategies; reduced public cost through the use of data provided by fishers (through their organizations); and, a better understanding of the behaviour of fishers.' (Johnston 1992).

These points deserve careful consideration. Co-management structure, it seems, could be made flexible enough to accommodate a modified system of IQs which will further provoke a proprietary interest among fishers in the marine resources (Cook 1986; Binkley 1990; Dupont 1991). Such a system would enable Canadian managers to capture some of the resource rent from the fisheries; revenues accruing to the government from the issuance of licensed-rights, and savings from reduced costs of monitoring enforcement, could then be used to enhance official emergency support programmes which emphasize the retraining of dislocated and redundant fishers.

From the above, it is clear that fisheries management in Canada is confronted with a wide variety of challenges. To discharge the responsibility of sustainable development, Canadian marine policy must take into account scientific information regarding environmental factors in the fisheries, in particular how stock migration, fertility patterns, and multi-specie interactions affect productivity. In coping with the problems of common-property, perhaps official policy process will be better served by incorporating local fishing communities with expertise in fishing, as suggested in the co-management proposal. Lastly, government's economic development policy has contributed to the twin tragedy of over-capacity and unemployment. In order to eliminate sudden fluctuations in the financial fortunes of commercial fish plants, expansion of the industry must keep pace with genuine efforts towards establishing secure foreign markets for Canadian fish exports.

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