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Canadian Marine Fisheries Management: A Case Study

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30.1. INTRODUCTION

This chapter describes major trends in Canada's marine fisheries and their management in recent years. In just 30 years from 1960 to 1990, these fisheries went from underdevelopment to a situation of substantial overcapacity. Regulatory interventions mushroomed during the 1970s and 1980s. These included the introduction of seasonal total allowable catches (TACs), allocation of access among fleet sectors, limited-entry licensing, and ultimately individual quotas (IQs), some transferable. Initially, major benefits appear to flow from Canada's extension of fisheries jurisdiction to 200 miles in 1977. These were dissipated by overexpansion in both the harvesting and processing sectors.

The bubble of euphoria burst in July 1992 with the dramatic collapse of the Newfoundland and Labrador northern cod fishery that had sustained Atlantic Canadian coastal communities for hundreds of years. Most Atlantic groundfish stocks were placed under moratoria by 1993–1994. Pacific salmon also underwent a dramatic downturn in the late 1990s. Draconian measures were implemented to address conservation concerns.

In contrast, the major shellfish stocks on the Atlantic became extremely abundant. A decades-long surge in Atlantic lobster landings continued, and there were major increases in the abundance of shrimp and snow crab. These fisheries replaced groundfish in many areas of Atlantic Canada.

30.2. NATURE AND STATUS OF CANADA'S MARINE FISHERIES

30.2.1. Trends in Canada's Marine Fisheries

Canada has important fisheries on both the Atlantic and Pacific coasts, in the Inland lakes and small fisheries in the Arctic. The regional impact has historically been the most significant in the provinces of Newfoundland and Labrador, Prince Edward Island, and Nova Scotia. In British Columbia, the fisheries are economically relatively less important than the Atlantic.

Historically, in the Atlantic, groundfish and lobster were the prominent commercial species fished. On the Pacific, salmon was king, particularly sockeye. The harvest of Canadian commercial fisheries peaked in 1988 at 1.6 million metric tons landed. From 1990 to 1995, landings declined to 850,000 metric tons, largely due to the collapse of Atlantic groundfish stocks. Landings then began a slow rise from 1995 onward to about 1.1 million metric tons in 2004 (figure 30.1). The landed value increased dramatically, more than doubling between 1980 and 1987, and reached a peak of \$2.2 billion in 2003 (figure 30.1).

In the 1980s groundfish dominated Atlantic landings quantities, but shellfish (shrimp, lobster, and crab) constituted more than half the landed value (figures 30.2 and 30.3). In the Pacific, salmon

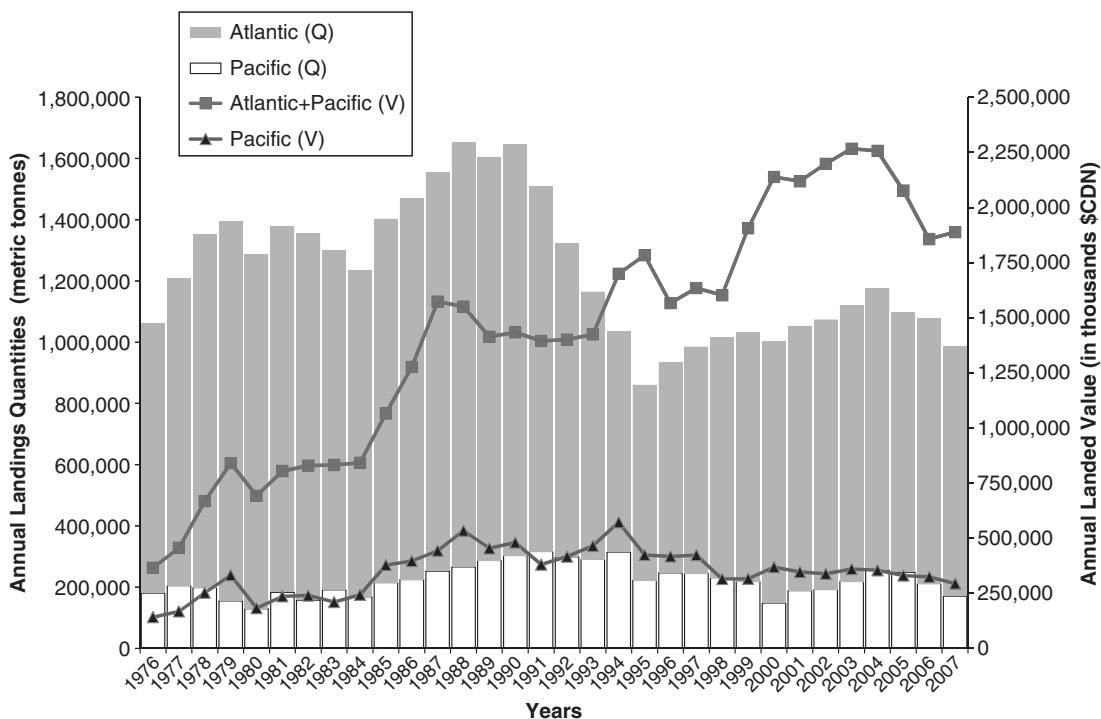


FIGURE 30.1 Atlantic, Pacific, and total Canadian fisheries landings and landed value, 1976–2006. (Data from Fisheries and Oceans, Statistics Division, Ottawa, Ontario)

accounted for 33 percent of the Pacific catch (annual landings), while Pacific groundfish species constituted 44 percent. Salmon was king of landed value, at 60 percent of total average annual Pacific landed value (figures 30.4 and 30.5).

Almost 20 years later, in 2004, the situation had changed significantly following major upheavals and stock collapses in both the Atlantic groundfish and the Pacific salmon fisheries. The species composition of the Atlantic fisheries had completely transformed. Groundfish had dropped to only 14 percent of landings and 8 percent of landed value. Shellfish species were dominant, accounting for 54 percent of landings and 87 percent of landed value, with crab and lobster landings leading the way in 2004 at 32.5 percent and 31.3 percent, respectively (figures 30.2 and 30.3).

The Pacific fisheries had also changed. In 2004, Pacific groundfish species accounted for 71 percent of landings, with salmon accounting for only 10 percent. Groundfish also accounted for 39.2 percent of landed value, with shellfish a close second at 36.3 percent. Salmon had dropped to only 15 percent (figures 30.4 and 30.5).

30.2.2. Status of Canada's Major Fish Resources

30.2.2.1. Atlantic Groundfish

Commercial fisheries for most of Canada's Atlantic groundfish stocks were placed under moratoria by 1994, thereby reducing the annual Atlantic groundfish landings. Many of these moratoria remain in place 15–16 years later. In the interim, there have been some very limited reopenings of small commercial fisheries for cod. Many of the straddling stocks of cod and other groundfish on the Grand Banks also remain under moratoria (Parsons 2005a) (figure 30.2).

There has been considerable debate about the reasons for the collapse of northern cod. Some argued that overfishing was the primary reason for stock collapse (Hutchings and Myers 1994; Myers et al. 1996, 1997). While overfishing was clearly a contributing factor, it was not the only one. Others have suggested that the collapse was caused by a combination of overfishing and detrimental environmental conditions that reduced the stock's productivity (Atkinson et al. 1997; Mann and

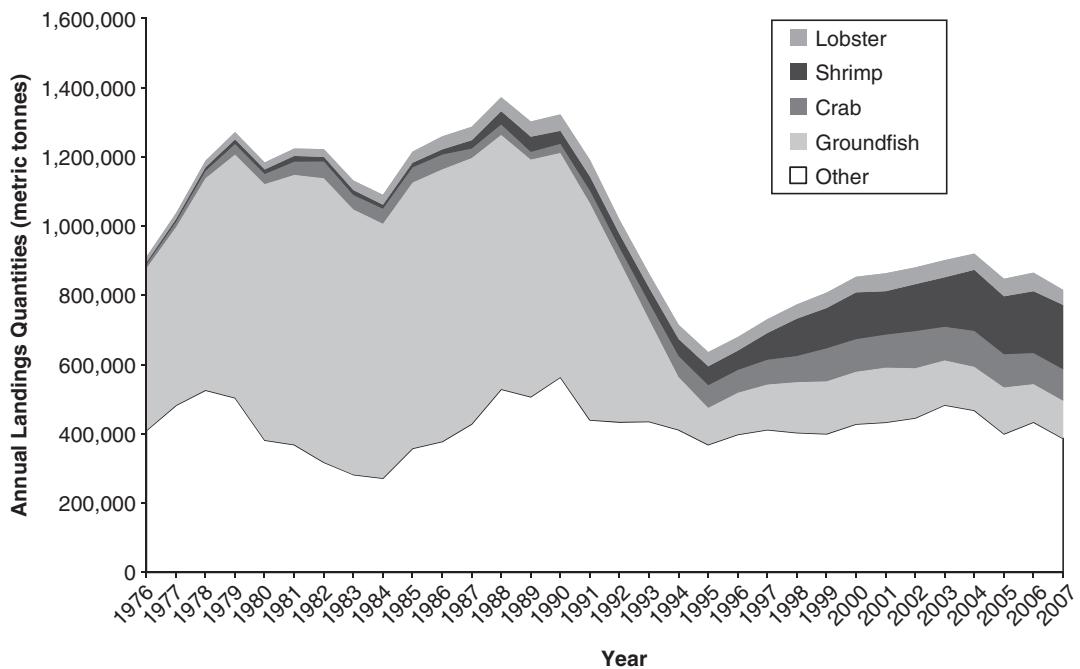


FIGURE 30.2 Canadian Atlantic landings by fishery (metric tons), 1976–2006. (Data from Fisheries and Oceans, Statistics Division, Ottawa, Ontario)

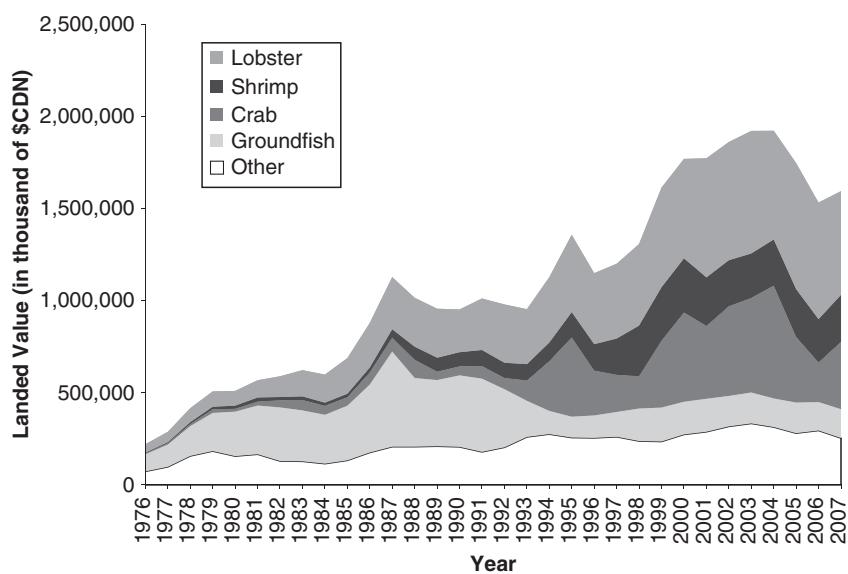


FIGURE 30.3 Canadian Atlantic landed value by fishery (nominal CA\$), 1976–2006. (Data from Fisheries and Oceans, Statistics Division, Ottawa, Ontario)

Drinkwater 1994; Parsons and Beckett 1997; Rose et al. 2000).

Harsh environmental conditions can be linked to the changes that occurred in the North Atlantic Oscillation Index (Parsons and Lear 2001). Drinkwater (2002) also provided evidence that ocean climate conditions, cold temperatures in particular, played an important role in the decline of cod. The environmental changes affected many species other than cod, for example, capelin and Atlantic salmon, were negatively affected, while various shellfish species, particularly lobster, crab, and shrimp, experienced population booms. Halliday and Pinhorn (2009) concluded that the occurrence of a sudden large-scale ecosystem disruption in the early 1990s provides a more coherent explanation for all the biological changes observed in groundfish populations at that time. In contrast, there does not appear to have been enough fishing effort to cause the precipitous declines in groundfish biomasses about 1990. They proposed that environmental, not fishing, effects were paramount in determining the changes in groundfish populations in the early 1990s.

30.2.2.2. Atlantic Shellfish

During the 1990s, shellfish landings rose to record high levels. Lobster, crab, and shrimp became the most lucrative Atlantic fisheries (figures 30.2 and 30.3).

30.2.2.2.1. Lobster Lobster landings increased dramatically through the 1980s, peaking at 53,000 metric tons in 2006 (figure 30.2). These increases occurred during a period when the exploitation rate was high on juvenile lobsters. The synchronized increases in landings (figure 30.2) suggest that the increased recruitment was driven by environmental influences (Mann and Drinkwater 1994).

Atlantic lobster was reviewed by the Fisheries Resource Conservation Council (FRCC) in 1995. The council recommended measures to increase the level of egg production and to reduce significantly both exploitation rates and the fishing effort (FRCC 1995). In 2006, the FRCC reviewed the 1995 Conservation Framework in the most comprehensive recent analysis of the lobster fishery (FRCC 2007). The FRCC reiterated the need for the industry to adjust and control fishing effort to maintain a balance with the available resource, and continued to warn that further increases in fishing effort represented a threat to sustainability of the

lobster resource. While the lobster fishery has so far defied doomsayers, it is hard to conceive how it can continue to prosper as currently structured. The question is not if, but when, the lobster bubble will burst. As a result of the worldwide economic downturn in 2009, lobster prices dropped dramatically, prompting fishers to call for financial assistance.

30.2.2.2.2. Crab During the 1990s, Atlantic snow crab (or queen crab) abundance also increased dramatically. Atlantic-wide, landings rose rapidly from 26,000 metric tons in 1990, peaking at 106,000 metric tons in 2002. By 2006 there was a drop in landings to 89,000 metric tons. The question is whither from here (figure 30.2).

Snow crab prefers cold water. A substantial expansion of the areas of cold water off Newfoundland in the late 1980s and early 1990s may have assisted in the unprecedented growth of the snow crab stocks. The impact of the cod collapse on the increase in snow crab remains unknown. Recently, there has been a warming of bottom waters. This may have a negative impact on the crab stocks (Department of Fisheries and Oceans Canada [DFO] 2000).

Dependence on snow crab has become very high. In some areas, fishing enterprises depend on snow crab for between 90 and 100 percent of their incomes (FRCC 2005). Following the snow crab boom from the mid-1990s to mid-2000s, there are now signs of a downturn. Landings have declined somewhat. TACs for snow crab have declined in recent years in several areas. Crab prices declined between 2004 and 2006, leading to a 61 percent reduction in landed value (figure 30.3). The surging Canadian dollar has also adversely affected profitability (Gardner Pinfold Consulting 2006a). Thus, resource abundance is declining when markets are weak and costs of fishing effort are rising (e.g., fuel).

30.2.2.2.3. Shrimp Shrimp populations also increased dramatically off Newfoundland and Labrador during the 1980s and 1990s. Landings virtually quadrupled in a decade, rising from about 45,000 metric tons to 175,000 metric tons (Gardner Pinfold Consulting 2006b). Favorable environmental conditions have probably led to the increase in shrimp stocks (Koeller 2000; Parsons and Colbourne 2000; Parsons and Lear 2001). The surge in shrimp abundance also coincided with the decline in groundfish, releasing predation pressure (Lilly 2006) (figure 30.2).

Shrimp are managed by TACs, subdivided into individual quotas (IQs) or individual transferable quotas (ITQs) for the inshore sector, and enterprise allocations (EAs) for the offshore. The number of participants expanded as TACs increased, first through temporary permits, and then the conversion of these to regular licenses.

The resource outlook for shrimp remained positive in 2006–2007. The exploitation rate remains low (about 10–20 percent). The major challenge facing the shrimp industry is steadily declining prices, by 40–50 percent over the last decade, and declining financial viability (Gardner Pinfold Consulting 2006b).

30.2.2.3. Pacific Salmon

Historically on Canada's Pacific coast the salmon fisheries have been the most valuable and the most complex. Traditional management has been based on ensuring an escapement of salmon to natural spawning beds to maximize subsequent recruitment, and on augmenting natural production by artificial propagation and improvements to spawning and nursery habitat. All five Pacific salmon species supported valuable commercial fisheries. Through the 1980s, Pacific salmon, accounted for 50–70 percent

of the landed value of the British Columbia commercial catch when abundance was high (Healey 1993) (figure 30.5).

Over the past two decades many Pacific salmon populations have come under increasing stress. By the late 1990s, conservation became the dominant priority. Pacific salmon abundance decreased substantially during the late 1990s. Commercial fishery landings declined from 107,000 metric tons in 1985 to only 17,000 metric tons in 1999 (figure 30.4). By the mid-1990s, aquaculture of Atlantic salmon along the Pacific coast and elsewhere in the world, notably Norway and Chile, had increased the supply of cheap salmon to the point where the economic viability of the commercial Pacific (wild) salmon fishery was being questioned. Concurrently, changes in the environment attributed to significant decreases in marine survival rates for all wild species of Pacific salmon, resulting in sharp declines in the abundance of Canadian salmon stocks, as well as some salmon stocks in the United States (Beamish et al. 1999; Noakes et al. 2002).

Due to conservation concerns about coho and chinook populations, severe fishing restrictions have virtually eliminated all commercial fisheries targeting coho and have substantially restricted the harvest of chinook. These two species now account



FIGURE 30.4 Canadian Pacific landings by fishery (metric tons), 1976–2006. (Data from Fisheries and Oceans, Statistics Division, Ottawa, Ontario)



FIGURE 30.5 Canadian Pacific landed value by fishery (nominal CA\$), 1976–2006. (Data from Fisheries and Oceans, Statistics Division, Ottawa, Ontario)

for less than 5 percent of the total catch. Sockeye salmon fisheries have also been curtailed due to conservation concerns (Noakes et al. 2002). By 2004, salmon accounted for only 15 percent of the landed value of the commercial fishery (figure 30.5).

Pacific “other” stocks, including Pacific groundfish, herring, and invertebrates (all together), in 2004 accounted for 71 percent of landings, with salmon accounting for only 10 percent. Other Pacific stocks had 85 percent of the landed value in 2004, while salmon landed value had dropped to only 15 percent (figures 30.4 and 30.5).

30.3. GOVERNANCE OF MARINE FISHERIES IN CANADA

The federal–provincial division of powers over fisheries in Canada was established in the Constitution Act of 1867 (Department of Justice Canada 1867). Section 91 of the Constitution Act assigned exclusive legislative authority over “sea coast and inland fisheries” to the federal government. Provinces could legislate on matters regarding property

and civil rights in fisheries such as transfers, rights of inheritance, or conditions of leasing a provincially owned fishery. The federal government was given the authority to regulate the conservation and preservation of fisheries resources, including such matters as type of fishing gear, limits on the amount of catch, close seasons, and the species and size of fish that may be caught. Federal jurisdiction on these matters encompasses all Canadian waters, both marine and inland to the present (Parsons 1993a).

The Minister of Fisheries and Oceans exercises the authority to manage the fisheries under the Fisheries Act, originally passed in 1868, and regulations made under this act (DFO 1985). The minister is accountable for the protection and sustainable use of fisheries resources and their habitat. The minister also exercises broader powers under the Oceans Act of 1997 (DFO 1996) and has certain responsibilities under the Species at Risk Act of 2002.

The minister’s authority includes the discretion and powers necessary to regulate access to the resource, to license, and to impose conditions on harvesting and the enforcement of regulations.

Under the Oceans Act, the minister is also authorized to conduct scientific research and operate vessels and laboratories for the purpose of meeting the obligations of the Act. Government laboratories conduct most scientific research in support of fisheries management.

Systems for management of the marine fisheries developed differently in different regions of Canada (Parsons 1993a). The system has been described by some as a primarily “command-and-control system” responsible for the research, assessment, allocation, licensing, regulation, and enforcement aspects of the fishery (de Young et al. 1999; Lane and Stephenson 1998).

30.4. EVOLUTION OF FISHERIES MANAGEMENT

The 1960s through the 1990s were decades of dynamic change in the management of Canada’s marine fisheries. From World War II until the early 1960s, development and modernization were emphasized. During this period, the regulatory regime was relatively laissez-faire. In the late 1960s, the emphasis shifted to the pursuit of conservation and economic/social objectives. During this period, it became evident that major stocks were being threatened by intense fishing pressure. Regulatory interventions mushroomed over the next two decades.

30.4.1. Limited-Entry Licensing

The federal government moved to limit entry into the fisheries, commencing with the Atlantic lobster and Pacific salmon fisheries in 1967 and 1968. By the mid-1970s, limited-entry licensing had been extended to virtually all major fisheries in Canada. Federal officials expected this to both reduce fishing pressure on threatened fish stocks and foster a more profitable industry.

Limited-entry licensing has had limited success in curbing overcapacity and overinvestment in Canadian fisheries (Parsons 1993a). The Pacific salmon limited-entry licensing program has been judged unsuccessful by various analysts (Fraser 1979; Pearse 1982). The experience in the Atlantic lobster fishery was more positive. In this effort controlled fishery, limited-entry licensing constrained additional entry when lobster abundance increased substantially in the 1980s and 1990s.

Consequently, limited licenses have certainly acquired a capital value, in many cases quite substantial. Officially, the license is a privilege, which confers no property rights. In practice, the license holder can determine the recipient of the transferred license when he retires from the fishery (Parsons 1993a). The very high “prices” that limited-entry licenses now bring to those leaving the fishery is strong evidence that limited-entry licensing has helped to improve fishermen’s incomes in many fisheries. This leaves the major challenge of reducing fishing capacity where significant overcapacity exists. Limited license buyback schemes have been tried in various fisheries. Overall, buyback programs have not been successful in reducing overcapacity (Holland et al. 1999).

30.4.2. Catch Quotas

The other major change in the 1970s was Canada’s push for direct controls on the amount of catch to limit fishing mortality. The government had already introduced catch quotas in the British Columbia herring fishery, following the moratorium on fishing from 1968–1970. Canada was instrumental in securing agreement within the International Commission for the Northwest Atlantic Fisheries in the early 1970s to introduce TACs accompanied by national allocations of these TACs, a now universally accepted practice in regional fisheries management organizations. These initial TACs were set too high.

The immediate objective following the 200-mile limit in 1977 was to rebuild fish stocks that had been reduced to low levels. Canada adopted a more conservative reference level of fishing mortality for setting TACs for most finfish stocks (Gulland and Boerema 1973). While there was some stock rebuilding initially, in hindsight it is clear that this was not achieved. A constant spawning escapement strategy continued to be pursued for Pacific salmon, leaving the residual available for harvest. This strategy was also not successful for sustaining Pacific salmon stocks.

30.4.3. Access and Allocation

Major battles occurred over the acquiring access to the limited resource. Allocations apportioning access among fleet sectors developed in parallel with limited-entry licensing as ways to deal with problems arising from the classical “race for fish.” This

race arises from the designation of fish as “common property” (Hardin 1968, 1998). The effects of open access to fish resources became known as the “tragedy of the commons.” The underlying idea is that fish belonged to no one in particular and everyone in general.

Resource allocation is concerned with dividing a limited pie among many conflicting interests that have acquired access rights for stock exploitation. The pie is rarely large enough to satisfy all those seeking shares. The common property (or, more appropriately, the “common pool”; Ostrom 1990) nature of the resource promotes overcapacity in both the harvesting and processing sectors. A lack of intervention at an early stage in the development of a fishery inevitably compounds the problem. Overcapacity generates enormous conflict as interest groups compete for their “fair share” of the resource. To most groups, “fair share” means meeting their needs at the expense of others.

On the Pacific, resource allocations involved disputes not only among commercial fleet sectors but also between the respective needs and benefits of the commercial and recreational sectors, and between these two sectors and the developing allocations for First Nations’ fisheries. Conservation, native food fisheries, adjacency to the resource, and community dependence have been the dominant criteria in resource allocation decisions.

Through extensive consultations, consensus on some resource allocation issues was achieved. But there are always problem stocks where consensus is not possible. The problem then becomes one that the federal government is compelled to resolve. Historically, a large number of such access and allocation issues ended up on the minister’s desk.

On the Atlantic, an independent panel was established in 2001 to review allocation criteria. Following that report, sharing arrangements and allocation criteria have been formalized. On the Pacific, sharing arrangements for Pacific salmon shifted in the late 1990s as a result of the conservation crisis. Controversy over the share allocated to First Nations continues to this day.

30.4.4. Individual Quotas

When it was concluded that limited-entry licensing systems were not achieving the benefits envisaged and stocks continued to decline, many switched horses in the 1980s and became fervent advocates of the use of IQs and, in particular, ITQs. In Canada, IQs were first introduced in 1972 in the Lake

Winnipeg fishery and, in 1976, in the Bay of Fundy herring fishery (Munro 2000). Contrary to popular perception, Canada was a world pioneer in introducing IQs for managing fisheries.

A large-scale experiment with EAs (company quotas) was introduced in the Atlantic offshore groundfish fishery for 1982. Following a restructuring in 1983, a system of EAs was adopted as a five-year experiment in this fishery (Parsons 1983). This was subsequently adopted for ongoing management of the offshore groundfish fishery.

By the end of the 1980s, IQs had been widely introduced in Canada’s Atlantic fisheries (Burke and Brander 2000). On the Pacific coast, the concept had been tried in some small-scale fisheries. But perhaps the most famous British Columbia examples are the Pacific halibut and sablefish fisheries where individual vessel quotas (IVQs) were introduced in 1990. This application is widely regarded as successful (Turris and Sporer 1994).

Burke and Brander (2000) reported that IQs were then in place for more than 40 Canadian fisheries or fishing fleets, accounting for half of the value of Canadian fish landings in 2000 (table 30.1). By 2000, most quota-managed (TAC) fisheries had been placed on IQs. The major non-IQ fisheries at that time were Pacific salmon (escapement) and Atlantic lobster (effort controls), neither of which was managed by setting TACs. In 2008, IQ fleets accounted for an estimated 58 percent of Canadian landed value, and competitive fisheries for 42 percent of landed value (Leslie Burke, DFO, personal communication).

Advocates of ITQs stress certain features necessary to achieve benefits, including security of title, exclusivity, permanence, and transferability (Scott 1997). Security of tenure for license holders in Canadian marine fisheries is implicit but tenuous. Licenses are issued annually, and, under Section 7 of the Fisheries Act, the minister has “absolute discretion” with respect to the issuing of licenses. Licenses are, however, rarely revoked, and the government has on several occasions sought to buy back licenses. (It avoids the legal conundrum of buying what it owns by offering compensation for voluntary retirement of licenses.) With respect to transferability, government practice is to accept the recommendation of the departing fisher on who should benefit from the reissue of his license or quota. Of the cases listed in table 30.1, half had permanent transferability of quota, often with conditions attached.

With respect to exclusivity, generally the number of licenses has remained stable. But in instances

TABLE 30.1 IQ/EA programs in Canada 2000

Area and Species	Fleet or Fishery	Year Adopted	Permanent Transfers?
<i>Atlantic</i>			
Groundfish	Mobile gear < 65 ft 4T ^a (Gulf/Laurentian)	1989	Yes
	Mobile gear < 65 ft 4VWX+5 (Scotia-Fundy)	1991	Yes
	Fixed gear 45–65 ft (Scotia-Fundy)	1997	Yes
	Fixed gear cod < 65 ft, 3Ps Area 10	1998	No
	Fixed gear cod < 65 ft, 2J3KL	1999	No
	Mobile gear < 65 ft 4RS3Pn (Newfoundland)	1984	Yes
	Mobile gear cod < 65 ft, 3Ps	1998	No
	Offshore groundfish EA	1982	No
	Midshore groundfish EA	1987	No
Pelagic	Herring seiners > 65 ft 4RSTVn (Gulf, Newfoundland)	1983	Yes
	Herring seiners 4WX+5 (Scotia-Fundy)	1976	Yes
Shellfish	Snow crab areas 18/19, 25/26 (Gulf)	1979	Yes
	Offshore clam EA	1987	No
	Midshore snow crab—zone 12 (Gulf/Laurentian)	1990	No
	Snow crab area 13–17 (Laurentian/Newfoundland)	1992	No
	Snow crab (Newfoundland)		No
	Snow crab areas 20–24 (Scotia-Fundy)	1994	No
	Offshore scallop EA (Scotia-Fundy)	1986	No
	Scallop Middle North Shore (Laurentian)	1991	No
	Bay of Fundy scallop	1998	Yes
	Offshore lobster (Scotia-Fundy)	1977	Yes
	Shrimp 4RST (Gulf/Laurentian)	1991	Yes
	Northern shrimp EA	1987	No
	Shrimp 4VWX (Scotia-Fundy)	1996	Yes
	Shrimp 4R (Newfoundland/Laurentian)		No
	Sea urchin (Scotia-Fundy)	1995	No
<i>Lake Fisheries</i>			
	All commercial freshwater fisheries in Ontario	1984	Yes
	Lake Winnipeg quota entitlement	1972	Yes
	Cedar Lake IQ	1982	
<i>Pacific</i>			
Groundfish Pelagic	Sablefish IVQ	1990	No
	Halibut IVQ	1991	Yes
	Groundfish trawl IVQ	1997	Yes
	Herring spawn on kelp IQ	1975	No
Shellfish	Geoduck IVQ	1989	Yes
	Abalone IQ program (closed)	1980	No
	Red sea urchin IQ	1994	Yes
	Green sea urchin IQ	1996	Yes
	Sea cucumber IQ	1996	Yes

^aNumbers and letters indicate designations for statistical areas based on zones established by the Northwest Atlantic Fisheries Organization.

Source: Adapted from Burke and Brander (2000).

where there have been dramatic increases in resource abundance (e.g., Atlantic crab and shrimp), the issue of “sharing the wealth” has arisen. The government has been pressured to grant new access, particularly to fishers negatively impacted by the groundfish

collapse. So-called “temporary” licenses were issued in a number of these crab and shrimp fisheries. Recently, these temporary licenses have been made permanent in the Newfoundland crab and shrimp fisheries. These new licenses are IQ licenses.

There is no formal government policy to move in the direction of IQs. Instead, IQs are allowed to develop as extensions of fishing licenses where a significant proportion of license holders in a fishing fleet requests IQs and where they can reach agreement on a sharing arrangement and a fishing plan (Burke and Brander 2000; Peacock and Hansen 1999).

Has the use of IQs yielded benefits? Grafton et al. (2007) concluded that British Columbia's multispecies groundfish trawl fishery was much better managed than prior to the introduction of individual harvesting rights. The program led to better economic outcomes for vessels within the fleet. Turris and Sporer (1994) showed that revenues increased, and costs decreased, after the introduction of IVQs in the British Columbia halibut and sablefish fishery. IVQs in the Pacific halibut and sablefish fisheries (Munro 2000) and ITQs in the Atlantic offshore scallop fishery (Peacock and Hansen 1999) resulted in substantial reductions in the number of active vessels.

IQs can be developed in a piecemeal form, or as parts of fisheries, or as parts of fleets (e.g., separated by gear type, fishing areas, or fishing periods) at a time. Furthermore, IQs are possible without enabling legislation, provided that there is no legislation specifically prohibiting such development (as occurred in the United States) (Burke and Brander 2000).

30.5. EFFORTS TO REFORM THE GOVERNANCE SYSTEM, 1980–1995

The so-called “command-and-control” system of fisheries management in Canada has come under criticism from several sources. One feature most criticized is the allocation and access or licensing system, in particular, the minister’s absolute discretion under the Fisheries Act. Two major external reviews in the early 1980s (the Pearse Commission on Pacific salmon, and the Kirby Task Force on the Atlantic Fisheries) suggested that allocation and licensing be done by an independent body.

Peter Pearse, Commissioner of the Pacific Fisheries Inquiry, in his 1982 report on Pacific salmon fisheries proposed that limited-entry licensing be replaced by 10-year quota licenses in “those fisheries where it is feasible to do so.” He proposed limiting limited-entry licenses and quota licenses to terms of 10 years, adopting competitive bidding

procedures to allocate the total capacity for limited-entry fisheries and the TAC for quota fisheries, and creating a Pacific Fisheries Licensing Board as a Crown corporation (Parsons 1993b)

Pearse’s proposals were comprehensive, bold, and imaginative, but they touched off a firestorm of protests from commercial fishermen’s associations. Fisheries Minister Pierre de Bane rejected the auction idea and the proposal for a Crown corporation, stating: “I am not prepared to delegate to an outside body decision-making authority entrusted to Parliament” (quoted in *Vancouver Sun* February 19, 1983, as cited in Parsons 1993b). Following a change of government later in 1983, demands for fleet rationalization diminished with the resurgence of the Pacific salmon fishery during the mid-to late 1980s.

The 1982 Task Force on the Atlantic Fisheries, chaired by Michael Kirby, proposed a system of quota licenses that could be sold or traded (Kirby 1982). It also proposed establishment of “a quasi-judicial Atlantic Fisheries License Review Board that would act in a review and appeal capacity for the current licensing system, as well as for the system of enterprise allocations and quota licenses” (Kirby 1982). When the Kirby report was released, the government announced it had accepted most recommendations. One recommendation that was rejected was the proposal for a quasi-judicial licensing agency (Parsons 1993b).

In October 1991, then DFO Minister John Crosbie proposed the establishment of two agencies or boards, separate from the DFO, responsible for licensing and allocation matters. Minister Crosbie described the existing system requiring the minister to make all the decisions as “simply archaic” and “too political.” The rationale was the need to replace an anachronistic system of decision making based on ministerial discretion with a fairer, more impartial system responsive to the needs and views of industry. In 1993, Crosbie tabled legislation in Parliament to implement the reform proposal. Unfortunately, this proposal died when an election was called later that year (Parsons 1993a).

30.6. INSTITUTIONAL CHANGES AFTER THE GROUNDFISH COLLAPSE, 1992–1995

Minister Crosbie did make some fundamental changes in the way conservation advice was

developed for a minister's consideration. The Canadian Atlantic Fisheries Scientific Advisory Committee (CAFSAC), the peer-review body for government scientists, and the Atlantic Groundfish Advisory Committee, the Atlantic-wide consultative body for groundfish, were both dissolved (Parsons 1993a). The government established a new body, the FRCC, to provide independent and public advice on Atlantic fisheries conservation matters to the minister. The FRCC was a consultative body and the minister retained the decision-making power. Initially, the FRCC focused on groundfish. Its mandate was restricted to conservation. It consisted of 15 individuals with a background in the fishing industry or academe, as well as provincial delegates and federal fisheries officials as *ex officio* members.

Initially, the FRCC followed up on the 1992 northern cod moratorium by recommending the closure of many other groundfish fisheries and substantial TAC reductions in others. Associated with the creation of the FRCC, other changes were implemented in the scientific process inputting into the advisory process. CAFSAC was replaced by local-level regional advisory process in each DFO region. This process provided for greater involvement in the stock assessment process by fishing industry participants and included the participation of interested academics. Overall, fishermen and industry became much more involved. Rice (2005) evaluated the approaches that tried to bring experiential knowledge and transparency into fisheries science advisory processes. He concluded that inviting fishers as individuals, not as representatives of an organization or sector, was most beneficial.

Another initiative involved "sentinel fisheries," organized by scientists and fishing organizations, for the groundfish stocks where fisheries were closed. These were restricted fisheries that emulated commercial fisheries practices. They were designed by DFO fisheries scientists to provide ongoing statistically valid information on catch per unit effort (a proxy stock size parameter), stock areal distribution, and biological characteristics. By 1995, some 500 fishermen were occupied in sentinel fisheries at 114 locations throughout Atlantic Canada (Doubleday and Powles 1997).

The fishing industry also became more centrally involved, for example, by substantially increasing its contribution to fisheries monitoring. The coverage by the At-Sea Observer program was extended from large offshore vessels to a broader range of

fishery sectors, including the smaller "midshore" fleets. Dockside monitoring programs were introduced to many fisheries, to verify landings information previously obtained from sales slips and vessel logbooks. Industry organizations managed funds collected directly from individual vessels or enterprises and contracted directly for the services of observers and dockside monitors. These use standards set out by DFO for data quality and coverage. These programs have improved the quality of data on fishery removals, reduced bycatch, and enhanced population sampling characteristics (Doubleday and Powles 1997).

Comprehensive Joint Project Agreements were also used in some key fisheries during this period. A prime example of this was the industry-funded survey for snow crab in the southern Gulf of St. Lawrence. Other examples include the test fisheries for salmon and herring in British Columbia. These arrangements have, however, fallen on hard times since the Federal Court of Appeal of Canada's (2006) decision on *Larocque v. Canada*. The court held that the DFO cannot use fish allocations to finance scientific and fisheries management activities. The DFO has had to scramble to find additional funding for such initiatives, pending revision of the Fisheries Act.

The FRCC took very conservation-oriented decisions in its first few years (to 1996), but after 1997 came under criticism for recommending the reopening of some fisheries prematurely. In particular, fisheries for four cod stocks under moratoria resumed in 1997/1998, based on FRCC advice that they could sustain small fisheries. But the TACs advised by the FRCC for these cod stocks were unsustainable. In 2007, DFO Minister Loyola Hearn opened a so-called "stewardship fishery" for northern cod. What little rebuilding that might have taken place during the moratoria was quickly curtailed or reversed by the reopened directed fisheries (Shelton 2007). There is little or no prospect for recovery of these stocks under current removal levels, even though these are low.

30.7. NEW LEGISLATIVE AND POLICY INITIATIVES, 1996–2005

New legislation, focused on the "partnering" concept, was brought to Parliament in 1996 by DFO Minister Fred Mifflin. The approach would have enabled binding agreements whereby industry

members could take formal responsibility for some aspects of management. The legislation proposed the establishment of new tribunals to impose administrative sanctions such as fines, quota reductions, or license suspensions. Another election in 1997 derailed this legislative initiative.

The “partnering” initiative had aroused hostility among certain members of the fishing industry. DFO Minister David Anderson set up a panel chaired by academic Donald Savoie to examine the issue. Responding to negative feedback from parts of the fishing industry, the panel urged the minister not to go forward at that stage with the partnering legislation (Savoie et al. 1998). Meanwhile, major policy renewal initiatives were launched on the Atlantic coast from 2001 to 2004 and on the Pacific Coast in the late 1990s, continuing to the middle of this decade.

The Atlantic Fisheries Policy Review, initiated in 2001, culminated in a 2004 report (DFO 2004) that emphasized giving resource users a stronger role in the stewardship of the resource and making the access and allocation decision-making process more transparent and predictable, although authority was to remain in the hands of the DFO minister. It envisaged a transition whereby the role of DFO would evolve from one involving day-to-day management of fleets and fishing activities, to one concerned primarily with developing policy, setting direction, and evaluating performance. To achieve this, certain fisheries management responsibilities would be delegated to resource users. The DFO would continue to provide “sound scientific advice,” establish required conservation measures, and ensure compliance.

It was envisaged that the access and allocation of fisheries resources would be more stable and predictable, and decisions would be made and conflicts resolved through fair, transparent, and rules-based processes. The 2004 policy framework, however, contained no reference to independent allocation and licensing agencies.

Early in the Atlantic Fisheries Policy Review process, the minister established an Independent Panel on Access Criteria. It recommended that an independent Atlantic-wide Advisory Board be established as a default mechanism to address decisions regarding access that could not be resolved in a satisfactory manner within Atlantic Canada (Independent Panel on Access Criteria 2002). While most proposals were endorsed, the government rejected the proposal for an independent Atlantic-wide Advisory

Board. The minister would “continue to make the final decisions on all access and allocation matters” (Independent Panel on Access Criteria 2002).

On the Pacific, with the resurgence in salmon in the late 1980s, the concept of major reform was dropped, and managers got on with their normal business. One exception was the introduction of IVQs and ITQs, spreading to many fisheries, except Pacific salmon. By the mid-1990s chinook and coho stocks, the backbone of the growing recreational industry, were experiencing major declines. Some sockeye stocks were also in trouble. In 1994, Pacific salmon catches started plunging and declined to less than 20,000 metric tons. In the late 1990s, catches were curtailed because of the stringent conservation measures taken to protect chinook and coho.

In 1998, then DFO Minister Anderson released a “New Directions” discussion document on Pacific salmon (DFO 1998). This was followed by other documents on a policy for wild salmon, allocation, selective fishing, and improved decision-making processes.

The first New Directions document emphasized principles that fell into three categories: conservation, sustainable use, and improved decision making. Conservation of Pacific salmon stocks would be the primary objective, a precautionary approach would be applied, the department would aim for a net gain in habitat, and an ecological approach would guide management. Regarding decision making, the document promised that future salmon management would be “based on partnerships with clients, governments and other parties.” It also committed to pursue enhanced community, regional, and sectorwide input to decision making “through a structured management and advisory board system.” In October 1999, DFO released its allocation policy for Pacific salmon, which included provisions for an impartial Allocation Board (DFO 1999).

In March 2001, the Institute for Dispute Resolution at the University of Victoria identified certain concerns regarding the planned Allocation and Licensing Board among commercial and recreational stakeholders and First Nations representatives (Institute for Dispute Resolution 2001). After this report it appears that this particular proposal was abandoned.

In 2005, DFO Minister Gerald Regan released a policy statement for wild Pacific salmon (DFO 2005a). This document was silent on the governance process for dealing with allocation and licensing issues. It was clear that the concept of

arm's-length allocation and licensing boards was dead on both coasts.

30.8. FISHERIES ACT REDUX

In 2006, a new government revived the concepts of legislative change and fisheries management agreements. In December 2006, Minister Hearn tabled in Parliament a proposed overhaul of the 138-year-old Fisheries Act. Highlights of the legislation included an expanded role for fisheries participants in decision making, the adoption of clear principles dedicated to sustainable development, and a new sanctions system to be called the Canada Fisheries Tribunal, aimed at promoting more responsible fishing behavior. The minister noted that the words "absolute discretion" had been removed from the new Act. The tribunal proposal for dealing with offenders in a manner potentially faster and more efficient than the slower and more expensive court system was carried over from previous attempts to amend the Act.

After the initial proposal was rejected, Minister Hearn introduced a revised version of the legislation in November 2007. This took into account some of the criticisms voiced in the interim. One key change proposed in the preamble to the Act was an affirmation that the "fisheries are a common property resource."

The claimed benefits of the proposed new Act were that it would provide for, among other things, a greater role for fish harvesters in the management of the resource, stability and predictability in access and allocation decisions, and transparent decision making in the fishery sector. The minister would retain full authority to decide access and allocation in the coastal fisheries but at the level of policy, not by deciding individual cases. The minister would be obliged to take certain guiding principles into account.

There would be a move away from the current regime where licenses are issued by the minister. The minister could set policy that would be binding on DFO for the issuance of licenses, including eligibility criteria. Licenses would be issued by license officers, delegated by the minister. A key point is that licenses would not be considered to be property. (A possible complication is a recent ruling of the Supreme Court of Canada in the case of *RBC v. Saulnier*. The Court declared that, in the case of bankruptcy, licenses were legitimate collateral. In so doing, they appeared to reject the DFO "official"

notion of "license as privilege," but this is subject to further litigation.)

New provisions would allow the minister to allocate, for up to 15 years, shares of fish to fleets or groups in commercial, recreational, and Aboriginal fisheries. The process would be transparent. The new Act would also provide authority for the minister to enter into legally binding fisheries management agreements. These would provide a greater opportunity for collaboration between DFO and responsible groups. There appears to be widespread support for the proposed Fisheries Tribunal and an administrative sanctions system. The tribunal would also handle appeals of licensing decisions.

This legislation, introduced by a minority government, died when a new election was called in 2008. It is unclear whether, if reintroduced, it would be endorsed by Parliament given another minority government result.

30.9. OCEANS-TO-PLATE POLICY, 2006–2008

In April 2007, Minister Hearn announced a new policy named "Oceans to Plate" as the approach for viable commercial fisheries and aquaculture (DFO 2007). He described the policy as one where all sectors would be working together toward a common goal of "a sustainable, economically viable, and internationally competitive industry." In addition, the minister stated that "regulatory tools will be developed to self-rationalize," that is, "to adjust industry size to market and resource realities in a fair and efficient manner." One of the principles stated: "Fisheries policies and programs should foster self-reliance and resilience in the seafood sector, such that communities, harvesters, processors and other sector participants are able to address economic challenges and opportunities and adapt to changing resource and market conditions, *without government assistance*" (DFO 2007, emphasis added).

The emphasis on self-rationalization, and adaptation without government assistance, appeared to represent a departure from the approach of recent decades. This did not, however, mean a rush to corporate privatization of the fishery. At the same time, the minister reaffirmed the government's commitment to preserving the independence of the inshore fleet in Canada's Atlantic fisheries (DFO 2007). Control of the fishery and the benefits from harvesting were slipping from the hands of inshore

fishers as certain “controlling trust agreements” were weakening owner-operator and fleet policies. Minister Hearn announced measures to arrest this trend by creating a new “independent core” license holder category. This would be available only to fishers who retain control over the decision to request a “transfer” of the licenses they hold.

The “Oceans-to-Plate” approach also involved an increased focus on market demands as they relate to managing Canada’s fisheries. The reference was to development of “ecolabels” and processes for certifying seafood products as coming from sustainable fisheries. This was generating increasing pressure on Canada’s fishing industry and DFO to prove that these fisheries were being managed sustainably. The government committed to the greater integration of precautionary and ecosystem approaches in Canadian fisheries management. It also committed to develop “sustainability checklists” for all commercial fisheries. The checklists would evaluate the status of management measures and their contribution to conserving fish stocks. They would measure and review biological aspects of fisheries sustainability and would also report on the progress being made to incorporate the precautionary and ecosystem approaches (DFO 2007).

30.10. FINANCIAL ASSISTANCE FOR CANADA’S FISHERIES ON THE ATLANTIC AND PACIFIC COASTS

The statement in the Oceans-to-Plate policy that the fishing industry would be expected to become self-reliant and adapt to changing resource and market conditions without government assistance would, if implemented, represent a radical departure from the practice of previous decades. Crowley et al. (1993) reviewed federal assistance to the Canadian fishing industry from 1945 to 1990. This included regular programs and special initiatives. Many of the programs had exacerbated excess capacity in the industry. The regular assistance programs were discontinued by the early 1990s.

30.10.1. Atlantic Fisheries Restructuring

In the early 1980s, the federal government had intervened to restructure the offshore groundfish industry. This had been plunged into financial

crisis by debt financing of processing plant expansion at high interest rates. The federal government expended several hundred million dollars for this purpose. The restructuring involved combining various Newfoundland companies into Fisheries Products International. The two major Nova Scotia-based companies, H. B. Nickersons and National Sea Products, were restructured into a new National Sea Products (Nickerson’s Newfoundland assets had been absorbed into Fisheries Products International).

30.10.2. Assistance and Adjustment Programs in the 1990s

The Atlantic groundfish industry was again plunged into crisis in the early 1990s due to the groundfish collapse. The first in a series of assistance and restructuring programs over the next several years was the 1990 Atlantic Fisheries Adjustment Program (AFAP). This provided \$584 million over several years. Gough (2008) concluded: “Overall, the AFAP money went to useful work, but did little to reshape the industry in a major way.”

The Northern Cod Adjustment and Recovery Plan (NCARP) followed. The government then broadened assistance with the Atlantic Groundfish Assistance Program (AGAP). Altogether, AFAP, NCARP, and AGAP spent \$510 million on income support, for which nearly 40,000 qualified at the outset, although several thousand soon found other work. Another \$281 million went toward adjustment in the form of training and community economic development. The programs also devoted \$26 million to license retirement. This added up to approximately \$834 million in direct aid related to groundfish. These programs had a marginal impact on removing people and licenses from the industry, affecting mostly marginal operators (Gough 2008).

In 1994, DFO Minister Brian Tobin announced another \$1.9 billion for the Atlantic Groundfish Strategy (TAGS). TAGS provided funds for income support, employment counseling and training, and long-term community economic development. It also set a goal of reducing fishing capacity by 50 percent.

In 1998, Minister Anderson announced a financial assistance program for both coasts, the Canadian Fisheries Assistance and Restructuring (CFAR) program. CFAR provided another \$730 million on the Atlantic. About \$180 million went

to TAGS clients in lump-sum payments to compensate for the earlier-than-scheduled termination of TAGS; \$250 million was allocated for an Atlantic groundfish license retirement program to buy fishers permanently out of the fishery through reverse auctions.

NCARP removed about 1,300 fishermen, TAGS about 800, and CFAR about 2,500 fishermen for a total of 4,500 retirees. But most were smaller operators or even marginal participants. Gough (2008) concluded that the license retirement programs probably had no major effects on the viability of the remaining fleet. The upsurge in shellfish, particularly snow crab, in the 1990s was what restored viability for the remaining enterprises. Meanwhile, the various Atlantic groundfish adjustment programs had cost more than \$4 billion.

On the Pacific, from the 1970s to 2000 there were five vessel/license buyback initiatives. Two of these occurred during the 1996–2000 period. In 1996, Minister Mifflin introduced an \$80 million-dollar “voluntary license retirement program.” This program removed nearly 800 licenses, 19 percent of the fleet. In 1997, Minister Anderson secured another \$200 million (CFAR) for fleet reduction. This removed another 1,400 salmon licenses at a cost of \$192 million, about 30 percent of the original fleet. During the period 1984–1999 the number of vessels in British Columbia was reduced from 7,000 to about 3,900; the number of unregistered fishermen, from 18,200 to 8,700 (Gough 2008). The remaining fleet still had the capacity to harvest many times the available catch.

Grafton and Nelson (2005) examined the effects of buyback programs in the British Columbia salmon fishery. They concluded that the benefits would be short-lived, and fishing effort will creep back up over time. While buybacks may have reduced the severity of the problem and may have created an opportunity for change, they suggested that buybacks had not provided a lasting solution.

30.10.3. Unemployment Insurance

Apart from these initiatives, the largest government financial assistance program nationally was ongoing, namely, Fishermen’s Unemployment Insurance (FUI), now known as Employment Insurance. FUI came into being in 1957. Over the ensuing decades it led to thousands remaining in the fishery who would otherwise have left for “greener pastures,”

few though these opportunities were most of the time. The Kirby Task Force “sunset” provision for FUI was rejected (Kirby 1982). In 1987, fishermen and their buyers, as their “employers,” nationally paid in \$17 million and received benefits of \$223 million. Plant workers receive benefits as well; the benefits in 1988 were \$226 million.

About 47,000 fishers engaged in the commercial fishery from 2002 to 2005, approximately half the number of 1988. Only 12,000 of these were designated as core fishers.

Schrank (2005) conducted the most comprehensive study of the impact of FUI on participation in the fishery. He examined the Newfoundland fishery 10 years after the northern cod moratorium. He concluded that the perverse incentive effects of FUI kept fishermen from leaving the industry. He also observed that, despite the reforms, the system was more generous in 2002 than it had ever been. He concluded that the inshore harvesting sector of Newfoundland continues to be a commercially non-viable entity, dependent upon government transfers for survival.

In the absence of government transfers (FUI), it is probable that the Canadian fisheries would be transformed substantially. But, given the commitment by politicians to continue to provide such government transfers, the situation is not likely to change significantly, no matter which party is in power.

30.11. ABORIGINAL PARTICIPATION IN THE FISHERY

The question of the nature and extent of Aboriginal participation in commercial fisheries became a major lightning rod on both the Pacific and Atlantic coasts in the 1980s and 1990s. This led to major user conflicts on both coasts, particularly in British Columbia.

A historic decision by the Supreme Court of Canada in 1990, the *Sparrow* decision (Supreme Court of Canada 1990) concluded that Native peoples had a right to harvest salmon for food, social, and ceremonial purposes. In 1992, DFO developed an Aboriginal fishery strategy to foster greater Native participation in the fishery in an orderly manner. DFO began to grant communal (band) licenses to take fish for food, social, and ceremonial purposes. It also took steps to encourage Native participation

in the commercial fisheries. It helped Native people acquire about 200 licenses in British Columbia and 600 on the Atlantic. By 2000, about \$60 million had been spent, mostly in British Columbia, helping Natives acquire licenses, vessels and fishing gear (Gough 2008).

The Native food fishery became a major bone of contention as nonnative fishers argued that the increased food fishery served as the guise for a commercial fishery, with Natives selling the catch. Conflict between the Natives and nonnative fishermen often became intense.

In September 1999, the Supreme Court, in the *Marshall* decision, declared that Marshall, who had been charged with illegally fishing eels and selling them commercially, had a right to sell the eels stemming from treaties in 1760 and 1761 (Supreme Court of Canada 1999). These gave Natives in the Maritime provinces a right to fish commercially.

Faced with an uproar from commercial fishermen and riots in some areas, DFO Minister Herb Dhaliwal decided that there would be no fleet expansion, nor would anyone be forced out of the existing fleet to make room. Instead, compensation would be offered to existing fishermen to give up licenses on a voluntary basis. These would be reissued to Native bands, which would decide who would fish and how to share the benefits. The department entered into negotiations with the aim of reaching agreements with the 34 bands affected by the *Marshall* decision. About 200 commercial fishermen voluntarily relinquished their licenses. DFO made agreements with the majority of bands. Confrontation occurred with two bands, but overall the situation was resolved amicably. Although there are occasional flare-ups on both coasts, Native fishermen are being integrated into the commercial fishery. The Native food fishery for Pacific salmon remains a bone of contention in British Columbia.

30.12. NEW APPROACHES TO FISHERIES MANAGEMENT IN CANADA

The downturn in Atlantic groundfish and Pacific salmon stocks emphasized the need for new management approaches. There has been a renewed emphasis on conservation as the first priority and the need for a broader approach to the concept of

sustainable use. The precautionary approach and an ecosystem approach to fisheries have become prominent features of Canada's marine fisheries management system in the first years of the 21st century.

In December 1996, the Canadian Parliament adopted the Oceans Act (DFO 1996). This was the first comprehensive oceans management legislation in the world. The Act provides for the development and implementation of a national oceans management strategy based on the principles of sustainable development, integrated management, and the precautionary approach (Parsons 2005b).

Canada's 2002 Oceans Strategy statement emphasized the principle of integrated management, a commitment to planning and managing human activities in a comprehensive manner (DFO 2002). The strategy also emphasized the promotion of an ecosystem-based approach to management and introduced the concept of large ocean management areas.

In 2004, DFO defined 17 (later modified to 19) marine ecoregions for the purpose of ecosystem-based integrated management. Actions envisaged included a new national network of marine protected areas (MPAs) in all three of Canada's oceans. Initial pilot MPA areas had been identified in 1998. A decade later, some of these have only recently come to fruition (DFO 2005b). Overall progress on implementing MPAs has been slow. This has been attributed to the need to undertake extensive stakeholder consultations, but a lack of adequate funding in the early years also contributed to the slow pace of implementation.

Canada's approach to ecosystem-based management under the Oceans Act is broader than the ecosystem approach to fisheries management promoted by the Food and Agriculture Organization of the United Nations (FAO) and other agencies. A number of international fisheries legal instruments now make explicit references to ecosystem considerations. While there has been general agreement on the need to take ecosystem considerations into account in managing fisheries, there is no clarity or consensus on how this can best be done. Perhaps the best-known framework is that articulated by FAO (2003).

Parsons (2005b) provided a comprehensive review of recent initiatives with respect to an ecosystem approach in marine fisheries management globally. Parsons concluded that an ecosystem approach is not inconsistent with, nor a replacement for,

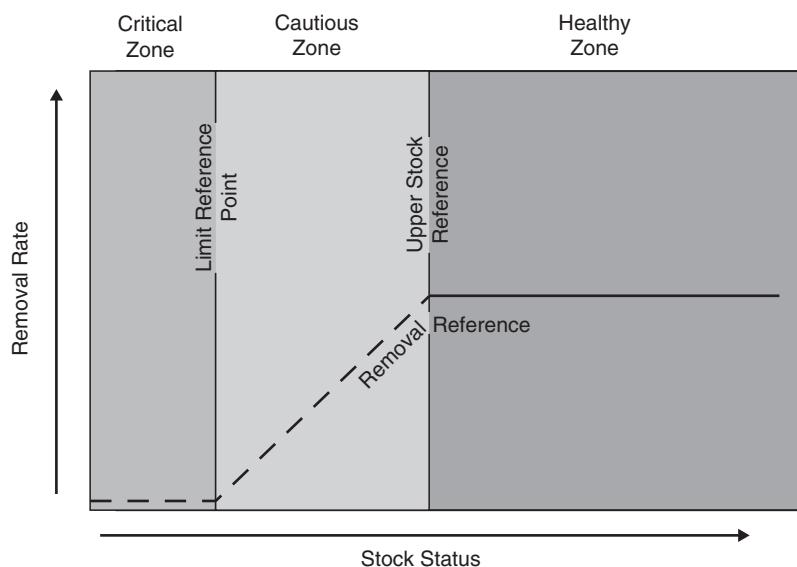


FIGURE 30.6 Fisheries management framework consistent with a precautionary approach. (DFO 2006)

existing fisheries management approaches. Nor is it a panacea for the problems confronting world fisheries. Parsons suggested that, realistically, we can only move to an ecosystem approach incrementally, starting with more rigorous/cautious application and extension of single species methods, while taking other considerations into account. A key element of an ecosystem approach would likely be to set harvest rates for target species at even lower, more conservative levels than might be suggested by single species analysis. Fisheries management measures should also ensure the protection not only of target species but also of nontarget, associated, or dependent species.

Canada has developed a federal framework for the precautionary approach to ensure the precautionary concept would be applied consistently across disciplines governmentwide (Privy Council Office 2003). There have been several initiatives in Canada to define the precautionary approach for fisheries, to identify benchmarks consistent with the approach, and to apply it in fisheries management. The Canadian precautionary approach framework prescribes three stock status zones for fish stocks: a critical zone, a cautious zone and a healthy zone, determined by limit reference points, an upper stock reference point and a removal reference (figure 30.6) (DFO 2006).

The precautionary approach and elements of it have already been applied to some fisheries in Canada. Initial work has focused on the identification of reference points for the biomass and, in some cases, removal references. Sustainability checklists are also being developed, dealing with both science and fisheries management. This approach appears progressive, but it is too early to assess the implementation. Shelton (2007) argues that action has not matched the statements about the commitment to use the precautionary approach. He contends that there has been an underutilization of science capacity to provide risk-based assessments and to evaluate management strategies for robustness to uncertainty and compliance with a precautionary approach.

30.13. CONCLUSIONS

Several groundfish stocks have failed to recover 15 years after the moratoria were initially imposed. Also, many stocks of Pacific salmon are at low levels, and the challenge remains of how to manage fisheries that intercept both abundant and threatened stocks of different species. Also there are concerns that the shellfish abundance (snow crab, shrimp, and lobster) on the Atlantic Coast, which is currently supporting much of the Atlantic

fishing industry, could take a downturn. The factors behind the increased abundance in shellfish are not well understood, although clearly there was an ecosystem shift off Newfoundland and Labrador, in particular, during the late 1980s to early 1990s (Rice 2002; Halliday and Pinhorn 2009). Oceanographic conditions have since reverted to an earlier pattern. This might not augur well for the sustainability of the current fisheries for crab and shrimp. Lobster remains a mystery. Despite repeated warnings over the past two decades about a possible imminent decline, lobster landings continue at record levels. Should the shellfish bubble burst, the implications could be catastrophic for Atlantic coastal communities and fishers as they have now become extremely dependent on lobster or crab, depending on the area.

The social assistance, industry restructuring, and science augmentation programs that were introduced at the time of the collapse were designed to last for five years. The substantial expenditures on income support, retraining, and vessel and license retirements amounted to nearly \$4 billion. A review by Canada's Auditor General indicated that benefits were hard to measure (Office of the Auditor General 1997). Some coastal communities survived, but this was due more to the lucrative new fisheries for crab and shrimp than to the government assistance programs during the early years of the moratoria. The review concluded that vessel and license retirements had been concentrated in the older vessels and fishers (and marginal participants). The profits from the upsurge in shellfish were being reinvested in new technologically sophisticated vessels capable of participating in many fisheries, including cod if it recovered. This occurred despite the vessel replacement constraints in effect that time. Overall, the Auditor General's report concluded that, despite the expenditure of nearly \$4 billion to "adjust" the Canadian Atlantic groundfish fishery, effective fishing capacity was 160 percent of what it had been in the early 1990s.

The major cod stocks will take a long time to rebuild to historical levels, if ever. Recent productivity over the northern part of the range had been much lower than 20 years previously when several stocks recovered from less severe declines. The main contributing factors were identified, in order, as increased natural mortality (due to predation), decreased body growth and, in some cases, reduced recruitment rates. Continued fishing in small directed and bycatch fisheries was also identified

as an important factor. Shelton et al. (2006) suggested that the small amounts of surplus production resulting from the combination of low stock size and low stock productivity were being dissipated by the limited cod fisheries and by catch in other fisheries.

A vast economic literature suggests that the move to incentive-based approaches based on property rights would foster the development of economically viable fisheries. There are notable instances in Canada where this in fact has occurred, for example, Pacific halibut, sablefish, multispecies groundfish trawl fishery, and southern Gulf crab and offshore scallops in Nova Scotia. In many other fisheries, IQs are being used to curtail the race for fish. But incentive-based approaches will not bring back the depleted cod stocks or prevent a potential resource downturn in Atlantic shellfish should changing environmental conditions reverse the recent surge in productivity of lobster, crab, and shrimp.

In Atlantic Canada one major constraint on achieving economically viable fisheries in the long term is the continued dependence of hundreds of coastal communities on fishing for survival. There is also a prevalent fishing culture that reflects that fishing is the preferred way of eking out a living. This is abetted by the generous income support available through the employment insurance system.

Ministers of differing political stripes chose, in the case of the upsurge in crab and shrimp abundance in the 1990s, to "share the wealth" rather than to make the existing license holders "obscenely wealthy." This was done by issuing temporary licenses, which, when the high resource abundance continued, were converted into permanent licenses. This particular choice reflects the dominant paradigm of making every effort to sustain coastal communities dependent on the fishery and to achieve "equity" in the fisheries sector. The government in 2008, which participated in a "share-the-wealth" decision by making temporary licenses permanent, has indicated that it is pursuing "ecologically sustainable, economically viable and internationally competitive fisheries" (DFO 2007). Its proposed revisions to the Fisheries Act contains some tentative steps in that direction, but these fall far short of enshrining the ITQ approach widely favored by the world's fisheries economist community. Indeed, the proposed new Act states that licenses are not property. In Canada, the

ultimate decision makers, politicians elected by the voters, no matter what their political stripe, do not share the economist's devotion to economic efficiency, in favor of nonspecified, equity-based socioeconomic objectives.

Canada's marine fisheries continue to be plagued by instability due to various problems and constraints (Parsons 1993a):

- Natural resource variability, often environmentally determined
- The common-property nature of fisheries resources and the resultant overcapacity/overfishing
- Market fluctuations/dependence on export markets
- Recurrent conflict among competing users
- Conflicting objectives for fisheries management
- Few alternative employment opportunities in coastal communities
- Social programs (e.g., FUI) that motivate fishers to stay in the fishery

Various combinations of these factors have contributed to recurrent boom-and-bust patterns in Canada's marine fisheries. While some progress has been made in the past 15 years, there is still an urgent need to bring harvesting and processing capacity into balance with sustainable resource levels. There has been some limited progress made on this front due to the greater use of IQs/ITQs approaches in many fisheries. Buyback initiatives appear to have had some favorable impacts in British Columbia but have failed miserably to reduce capacity in Atlantic Canada.

Periodic fisheries crises and demands for government assistance can be expected to continue unless alternative economic opportunities can be developed in the coastal regions of Canada. Most attempts at regional economic development have failed to generate lasting viable economic opportunities. Recent offshore oil and gas development has made some entrepreneurs rich and provided employment to others. Also there has been some outmigration to other provinces, particularly oil-rich Alberta. But this has not alleviated the dependence of fishers and coastal communities on the fisheries, both as a source of income and the means to access the Social Security net provided by the Employment Insurance program. Nor has it reduced the social pressure on governments to maximize employment in the fishery.

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