The groundfish fishery of Georges Bank
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Abstract

This paper considers the management of the Groundfish Fishery of Georges Bank. The fishery is regarded as one of the most commercially important fisheries on the Atlantic coast and thus has great socio-economic relevance in many coastal communities. The fishery has seen a general decline in landings and biomass of Atlantic cod, haddock and yellowtail flounder in the late 1980s and 1990s, and today there are signs of overcapacity. These problems stem from numerous factors. The fishery constitutes a transboundary, multispecies resource, which seasonally migrates between the national jurisdictions of USA and Canada. Further, since the implementation of 200-mile zones and the withdrawal from ICNAF in the mid-1970s, different approaches to fisheries management of the two nations have failed to complement each other in safeguarding sustainable and economically viable exploitation of the resource. However, there is some reason for optimism, with the continued expansion of cooperative management measures for the transboundary resources. Additional steps are also being proposed to help curb overcapacity and assist the rebuilding of traditional groundfish stocks.

Keywords: Georges Bank, transboundary groundfish fishery, New England fleet, Scotia-Fundy fleet, fisheries management, ICNAF, EEZ, overcapacity, cooperative management
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Acknowledgements

The authors are grateful to Jørgen Løkkegaard, Jon Sutinen and John Walden for helpful comments and suggestions on earlier drafts of this paper. Any shortcomings, however, remain the responsibility of the authors.

List of Acronyms

CHP  Conservation Harvest Plan
CMB  Community Management Board
DFO  Department of Fisheries and Oceans (Canada)
EA   Enterprise Allocation
EAFE European Association of Fisheries Economists
ECFA East Coast Fisheries Bilateral Agreement
EEZ  Economic Exclusive Zone
FMP  Fishing Management Plan
GRT  Gross Registered Tonnage
ICJ  International Court of Justice
ICNAF International Commission for the Northwest Atlantic Fisheries
ITQ  Individual Transferable Quota
MSY  Maximum Sustainable Yield
NAFO Northwest Atlantic Fisheries Organisation
NEFMC New England Fishery Management Council
NMFS National Marine Fisheries Service (USA)
NMFMP Northeast Multispecies Fishery Management Plan
SFA  Sustainable Fisheries Act
SSR  Stock Status Report
TAC  Total Allowable Catch
TMGC Transboundary Management Guidance Committee
TRAC Transboundary Resource Assessment Committee
UNCLOS United Nations Conference on the Law of the Sea
5Z  Georges Bank management area
5Zjm  Eastern Georges Bank management area (5Zej+5Zem)
ft  Feet
lb  Pound
mt  Metric tonne
1. Introduction

In a recent paper, the European Association of Fisheries Economists (EAFE) highlight the lack of consideration given to an economic approach to policy-making and its link to management problems experienced in fisheries worldwide. The paper specifically refers to the cause of overcapacity and overexploitation as follows:

“Fishing is an economic activity which exploits a self-renewing common property resource, fish stocks. The absence of effective stewardship permits a race to fish which is free to the user but which nevertheless has an economic value. This separation between the private cost and economic cost causes market failure. It creates an externality – a spillover effect – which manifests itself as an incentive to overcapacity and overexploitation. [This] fundamental problem has been known for decades (Warming 1911, 1931, Gordon 1954).” (EAFE 2001: page 1).

It is the failure of incorporating an economic approach that has at least partly been responsible for the continued problems of fisheries policy. The lack of resource ownership, the presence of externalities, and resultant market failure has led to consistent overexploitation of fish resources and excessive capital investments in the fishing industry. From an economic perspective, the current overcapitalised nature of the fishing industry represents a wasted economic rent, or an opportunity cost of invested capital, that could and should be utilised in a more efficient manner elsewhere in society.

The economic performance of fisheries has been an issue in fisheries management as most commercial fisheries have experienced dramatic declines in fish stocks, and thus also in the economic health of fishers, industries, and coastal communities (Morrison-Paul 2000). This has been highlighted by the magnitude of subsidies offered to the industry in recent years and has received global attention as a result. These subsidies work hand in hand with the lack of resource ownership to encourage excessive effort, over-investment in fishing capital and overexploitation of the fish stocks (Arnason 1998). The Georges Bank groundfish fishery is no exception to this general trend.

Harvesting, the process of catching fish and bringing them ashore, involves physical equipment that include gear (number, type, size, mesh-size, hook size, etc.), vessels (number, size, engine power, etc.), electronic equipment, as well as a major role for human skill and experience. The sum of physical equipment and human characteris-
tics is often called the “fishing (or harvesting) capacity”. Overcapacity occurs when the capacity is too high compared to the resource level, unable to sustain a viable economic activity. The present Georges Bank fishery is characterised by overcapacity: increasing amounts of gear, increasingly more efficient gear and vessels and increasing ability to find and catch fish.

Groundfish species on Georges Bank have been exploited at unsustainable levels, clearly reflected by quota reductions and the need for financial intervention to support the industry in recent years. The management measures in place have not effectively dealt with the race to fish phenomena often experienced under open access. Furthermore, the creation of Exclusive Economic Zones (EEZ) in the 1980s helped to reduce the size of fishing areas/opportunities, and so increasing the fishing pressure on stocks in certain areas. There has however been no corresponding reduction in fleet sizes, and in the case of Canada, the fleet size actually increased in order to exploit the fishery that now was under national jurisdiction. Since the resources are shared by two nations, increased competitiveness between fishers, as well as between the two nations, has seemingly helped to exacerbate the problem. Overcapacity appears to be an undesired by-product of this increased competition, a link that is not often referred to in fisheries literature, and is thus one reason for this paper. The problems encountered with transboundary fisheries also appear to have impacted the effectiveness of implemented management systems.

The theory of fisheries economics indicates that fisheries can be regulated efficiently if market forces are allowed to dictate the evolution of fishing fleets, discouraging the competitive build-up of excessive capacity and fishing effort. A management strategy that is based on output constraints and the internalisation of externality problems, through the use of for example landing taxation or individual property rights, would lead to divesting of capital in the fishery and a gradual optimisation of fleet capacity. The Atlantic fishery in Canada has been managed by a combination of individual and community quotas since 1992 and thus serves as an example of this kind of management system. The USA fishery on the other hand has consistently been managed through days at sea (effort) regulation. This paper therefore intends to compare and contrast these two management systems in relation to the evolution of the groundfish fishery of Georges Bank.
2. **Georges Bank fishery**

2.1. **Area characteristics**

The total primary production of Georges Bank is about three times the average value for the world’s continental ocean and about ten times the average value for the world’s deep ocean. It is this high rate of primary production that explains much of the overall annual productivity and abundant fisheries. Georges Bank is situated at the western end of a chain of banks extending from the Grand Banks of Newfoundland to Nantucket Shoals off the US coast (cf. Figure 1). The Northeast Channel separates Georges Bank from Browns Bank and the Scotian Shelf and the Great South Channel west of Georges Bank separates it and Nantucket Shoals. Today, Georges Bank is also used to describe the shallower part of Northwest Atlantic Fisheries Organisation (NAFO) management area 5Z. Area 5Zjm is the management unit defined as the eastern part of Georges Bank (depicted as Areas 5Zej and 5Zem in Figure 2).

![Figure 1. Georges Bank and surrounding areas](source: Herbert (1995))
The location of Georges Bank plays an important role in its physical oceanography. The shallowness of the bank limits the exchange of water between the Gulf of Maine and the deeper ocean to the east, restricting flow to the Great South and Northeast Channels. Browns Bank inhibits flow from the Scotian Shelf into the Gulf of Maine. Any interaction between water masses depends critically on seasonal thermoclines and vertical mixing caused primarily by tidal currents. Since these features change seasonally, so do the biological interactions that take place. These physical oceanographic conditions strongly influence the production of fish by affecting fish distribution and physiological processes such as the rate of growth and maturation. Migration patterns are largely determined by the location of feeding and spawning areas, which in turn affects fishing strategies on a seasonal basis.

### 2.2. Fishery characteristics

Groundfish is a term used to describe several species of demersal finfish that inhabit the continental shelf of the northwest Atlantic. One of the most significant aspects of the groundfish fishery that shapes their distribution and stock structure is the competition among the species. Since many of the species compete for food in the same areas,
productivity and availability of individual species may vary greatly from year to year. Groundfish biomass on Georges Bank has shown little trend in the last 30 years despite the over harvesting and collapse of many groundfish species. This is largely because of an increase in the abundance of other groundfish that are not impacted as heavily.

Several of the groundfish species on Georges Bank are considered transboundary. A transboundary resource is one whose distribution spans the boundary and for which there is substantial migration and movement across the boundary. Three of the most important groundfish species on Georges Bank historically and economically to the US and Canada are considered to be transboundary; they are Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*) and yellowtail flounder (*Limanda ferruginea*).

During the early 1960s distant water fleets from the former USSR, Poland, Germany, Bulgaria, Spain, and Japan began to venture to Georges Bank to take advantage of the abundant groundfish stocks. As more vessels fished the bank, the groundfish stock abundance began to decline. The establishment of 200-mile Exclusive Economic Zones (EEZs) since 1977 has excluded European and Asian vessels from fishing, permitting only Canadian and US vessels to harvest fish on Georges Bank. However, border disputes and other mismanagement concerns have prevented any major rebounding of the depleted groundfish stocks. The Canada/US boundary was finally established in 1984, limiting fishing of each country to their respective sides (cf. Figure 1). This issue is further discussed in Chapter 3.

Today the fishing fleets on Georges Bank are characterised by multispecies fisheries. Since the fishing gear cannot selectively harvest among individual species there is a bycatch relationship where fishers will direct their fishing efforts at one species and will unavoidably catch other groundfish species inhabiting the same areas. Seasonal switching may also occur among the various species. As one species becomes more abundant because of seasonal fluctuations, fishers will shift effort over to that species. The US fleet that fishes Georges Bank is dominated by vessels from New England (Maine, Massachusetts, Rhode Island and Connecticut) but also include vessels based further south toward New York and New Jersey. Vessels in the Scotia-Fundy region dominate the Canadian Atlantic fleet, with homeports located in Nova Scotia and New Brunswick.
2.3. Historical landings and resource distribution

In the mid-1970s increases in abundance of groundfish associated with the reduction of foreign fishing was followed by an increase in domestic fishing effort and landings. Abundance of principal groundfish began declining after 1978, reached record low levels in the early 1990s, and has since improved slightly, although abundance and biomass for most stocks remain low. Extensive changes in the species composition of the catches have also occurred over the past three decades, with shifts to previously less desirable species. The versatility of the domestic fleets has been shown in their ability to target different resources and to pursue various alternatives (NMFS 2000).

Most changes in resource abundance can be directly attributed to changes in fishing mortality (NMFS 2000). For example, increases in abundance of groundfish occurred during 1975-78 when fishing effort was being reduced by international and domestic management actions. Decreases in abundance began in the early 1980s when fishing effort from domestic fleets substantially increased. The record high levels of fishing effort in the late 1980s and early 1990s resulted in rapid reduction of new year classes before they were able to achieve full growth and reproduce, helping to change the overall mix of species targeted.

The historical landing trends of Atlantic cod, haddock, and yellowtail flounder by the US and Canadian fleets can be viewed below.

<table>
<thead>
<tr>
<th>Table 1. Average landings and total 2000 landings (mt), Georges Bank and South (Divisions 5Z and Sub-area 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic cod</td>
</tr>
<tr>
<td>- Canada</td>
</tr>
<tr>
<td>- USA</td>
</tr>
<tr>
<td>- Other</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Haddock</td>
</tr>
<tr>
<td>- Canada</td>
</tr>
<tr>
<td>- USA</td>
</tr>
<tr>
<td>- Other</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Yellowtail flounder</td>
</tr>
<tr>
<td>- Canada</td>
</tr>
<tr>
<td>- USA</td>
</tr>
<tr>
<td>- Other</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: TRAC (2001a, 2001b, 2001c)
As viewed in Table 1, all three fisheries on Georges Bank have seen a significant decline in landings since the 1970s and 1980s. A detailed description of the fishery development of the three main commercial species is given below, both in terms of landings and biomass.

It is clearly apparent that migration plays a pivotal role in determining stock concentrations and fishing opportunities on either side of the international boundary between Canada and USA. The graphical depictions below show that not only are their seasonal biomass differences, but there are also considerable shifts between the two jurisdictions from year to year. This has evidently compounded the problems of managing the transboundary resource.

2.3.1. Atlantic cod

Total commercial landings of Atlantic cod on Georges Bank were estimated to be 9,189 mt in 2000, considerably lower than the rates experienced from the mid-1970s to the early 1990s. In 2000, the New England fleet accounted for 83% of the total landings and the Scotia-Fundy fleet landed the remaining 17%. US landings have predominantly been from the western part of Georges Bank during April-June. Landings from the eastern part have declined by about 50% since 1993. The Canadian cod fishery opens in June and landings are thus predominantly in July-September. In 2000, otter trawl gear accounted for the majority of the US landings (62%). Canadian landings were primarily taken by otter trawl (34%) and long line gear (51%).
The landings statistics clearly show a worsening of the resource situation during the 1970-2000 period, and is supported by the general biomass trend for 5Z Atlantic cod. Since 1995, and with reduction in allowable yields, the Georges Bank fishery has become more of a mixed fishery with reduced targeting for cod and in 1995 fishing was restricted to bycatch only. There is also little survey evidence to show that the current cod stock is in the process of recovering to the levels of the 1970s and early 1980s.

For cod on eastern Georges Bank (5Zjm), the surveys indicate a seasonal migration pattern, westward between fall and spring and eastward between spring and fall (cf. Figures 3b-c). This is consistent with the spawning behaviour of cod, that are thought to migrate to shallower depths on the Bank for spawning during the colder winter-spring season and move to the deeper slopes during the warmer summer-fall season. The migration pattern is not as obvious on Georges Bank (5Z). This is probably due to the confounding by the movements of the Southwest Channel components where there may be migration during the summer-fall to the deeper slopes of both the South Channel and the Northeast Peak.
Figure 3.b NMFS spring biomass of 5Zjm Atlantic cod, 1968-2000

Source: TMGC (2002)

Figure 3.c NMFS fall biomass of 5Zjm Atlantic cod, 1963-2000

Source: TMGC (2002)
2.3.2. Haddock

US landings since 1994 are considered preliminary and subject to revision. Landings of haddock by the New England fleet saw a rise in 2000 to a level of 3,366 mt, the highest level since 1985. The spatial distribution of catches indicates that the fishery is largely concentrated in the western part of Georges Bank. This trend has been evident since 1994 when the combination of days at sea regulation and area closures excluded New England vessels from fishing seasonal haddock concentrations in eastern Georges Bank. This resulted in a westward and inshore shift in fishery effort.

Figure 4.a Commercial landings of 5Z Haddock, 1970-2000

Source: TMGC (2002)

Temporal trends in US landings indicate that most landings occur in the third and fourth quarters, apparently related to migration and spawning patterns in the western portion of the bank and liberalisation of trip limit regulations in the second half of the year. Landings have been dominated by trawl gear. Canadian haddock landings increased by almost 50% from 1999 to 2000, to a level of 5,402 mt, the highest level of Georges Bank haddock landings since 1991. The otter trawls and longliners less than 65ft in length have taken the majority of haddock landings. Evidence from biomass surveys of 5Z haddock support the landing trends, and indicate that the haddock stock
has recently shown signs of recovery following the fishery downturn in the 1980s and 1990s.

Similarly for haddock on eastern Georges Bank (5Zjm), the surveys indicate a seasonal migration pattern, westward between fall and spring and eastward between spring and fall (cf. Figures 4b-c). This is also consistent with the spawning behaviour of haddock, that are thought to migrate to shallower depths on the Bank for spawning during the colder winter-spring season and move to the deeper slopes during the warmer summer-fall season. Similar to cod, the migration pattern is not as obvious for haddock on Georges Bank (5Z). Again, this is probably due to the confounding by the movements of the Southwest Channel components, where there may be migration during the summer-fall to the deeper slopes of both the South Channel and the Northeast Peak.

**Figure 4.b** NMFS spring biomass of 5Zjm Haddock, 1968-2000

Source: TMGC (2002)
2.3.3. **Yellowtail flounder**

The New England fleet has predominantly been responsible for landings of yellowtail flounder on Georges Bank. However, since the spatial expansion of Closed Area II in 1995 fishing effort was drastically reduced in order to allow the stock to rebuild. The proportion of Canadian landings has since increased, a fishery previously unexplored by the Scotia-Fundy fleet. Since 1995, total landings have steadily increased and in 2000 landings were 6,537 mt, although this is still a far cry from the high landing rates of the 1970s and mid-1980s. Catch quotas have been imposed on the Canadian yellowtail flounder fishery since 1995.
The New England fleet fishing for yellowtail flounder has predominantly used the otter trawl as its primary gear (95%), although bycatch in the scallop dredge fishery can be substantial. The trawlers have generally targeted multiple species in the southwest part of the Bank and on the northern edge just west of Closed Area II, adjacent to the international boundary. The Scotia-Fundy fleet has also been dominated by otter trawlers of less than 65ft in length. The fishery peaks in July-October and is concentrated in the southern half of the Canadian fishing zone in an area often referred to as the “Yellowtail Hole”. The 5Z yellowtail flounder biomass has fluctuated, and the fishery experienced a downturn during the mid-1980s to mid-1990s. Both biomass and associated landings have recovered in recent years.

The resource distribution results for 5Z (Georges Bank) yellowtail flounder have not shown persistent seasonal patterns, as in the case of cod and haddock, and thus migration across the boundary is regarded as minimal and of little management concern. Note that due to this lack of migration, the yellowtail flounder is managed as one 5Z stock and does not consider the 5Zjm yellowtail as a separate stock.
Figure 5.b  NMFS spring biomass of 5Z Yellowtail flounder, 1968-2000

Source: TMGC (2002)

Figure 5.c  NMFS fall biomass of 5Z Yellowtail flounder, 1963-2000

Source: TMGC (2002)
2.4. New England fleet

New England fishing vessels go to Georges Bank in all seasons of the year, however the majority, particularly the smaller vessels, fish offshore only in the milder part of the year (offshore is defined as 20 nautical miles or more from the coast). There is no set schedule; each captain evolves his own pattern of fishing, depending on the abilities of his vessel and crew and on the market. Time spent on the fishing grounds varies with the season and the particular management measures required for that vessel. Groundfish trips generally last 3 to 8 days. A typical vessel in good operating condition fishes about 200 days a year; some fish as few as 85 days, some up to 290. However, current groundfish regulations limit most vessels to fish groundfish only 88 days per year, although some may have up to 160 available days. The mix of species sought usually varies over the year: cod and haddock in the spring for instance and yellowtail flounder in the winter. Shifting from one species to another has become characteristic of the New England fleet’s fishing strategy as different fish stocks have become depressed. Smaller vessels fish only seasonally on Georges Bank, mostly for mixed groundfish or scallops. The largest vessels that continue to fish in the area are the large otter trawlers. Smaller wooden or steel otter trawlers known as draggers or medium otter trawlers also fish Georges Bank regularly.

It is common to divide the gear types in two broad categories: Mobile Gear (otter trawl, Danish seine), that are dragged on the bottom or in mid-water; and Fixed Gear (longlines, hand-lines and gillnets), that are put in place for a certain period of time. Many of the vessels participating in the groundfish fisheries switch gears on a seasonal basis.

![Table 2. Number of otter trawl vessels in the New England region, 1994-99](image)

<table>
<thead>
<tr>
<th>Year</th>
<th>&lt;5GRT</th>
<th>5-50GRT</th>
<th>51-150GRT</th>
<th>151+GRT</th>
<th>Total</th>
<th>New England vessels</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>31</td>
<td>419</td>
<td>299</td>
<td>94</td>
<td>843</td>
<td>2,384</td>
</tr>
<tr>
<td>1995</td>
<td>40</td>
<td>488</td>
<td>291</td>
<td>90</td>
<td>909</td>
<td>2,411</td>
</tr>
<tr>
<td>1996</td>
<td>44</td>
<td>510</td>
<td>284</td>
<td>96</td>
<td>934</td>
<td>2,549</td>
</tr>
<tr>
<td>1997</td>
<td>31</td>
<td>486</td>
<td>280</td>
<td>102</td>
<td>899</td>
<td>2,521</td>
</tr>
<tr>
<td>1998</td>
<td>35</td>
<td>456</td>
<td>257</td>
<td>99</td>
<td>847</td>
<td>2,255</td>
</tr>
<tr>
<td>1999</td>
<td>18</td>
<td>394</td>
<td>256</td>
<td>87</td>
<td>755</td>
<td>2,127</td>
</tr>
<tr>
<td>1994-99</td>
<td>-42%</td>
<td>-6%</td>
<td>-14%</td>
<td>-7%</td>
<td>-10%</td>
<td>-11%</td>
</tr>
</tbody>
</table>

Source: Roundtree *et al.* (2001)

The total number of vessels appears to have decreased over the 1994-99 period and represent further evidence of the general decline in fishing opportunities. The otter trawl vessels dominate the New England fleet. In 1999, the otter trawl fleet was com-
prised of 755 vessels, with vessels in the 5-50GRT segment representing over 50% of the total. A significant reduction in vessel number in this segment is likely to be related to Multispecies Fishery Management Plan regulations put in effect in 1996, a plan that no longer exempted all small vessels from certain effort restrictions (Roundtree et al. 2001). Average vessel characteristics, activity and revenue data for the New England otter trawlers can be viewed in Table 3 below. It should be noted that this table reflects activity in all fisheries, not just groundfish, and hence the days at sea and landings are higher than if the vessels were to fish for groundfish only.

### Table 3. Characteristics and revenue data for New England otter trawlers, 1999

<table>
<thead>
<tr>
<th></th>
<th>&lt;5GRT</th>
<th>5-50GRT</th>
<th>51-150GRT</th>
<th>151+GRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of vessels</td>
<td>18</td>
<td>394</td>
<td>256</td>
<td>87</td>
</tr>
<tr>
<td>Average age</td>
<td>14</td>
<td>24</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>Average GRT</td>
<td>3</td>
<td>23</td>
<td>101</td>
<td>176</td>
</tr>
<tr>
<td>Average days at sea</td>
<td>-</td>
<td>127</td>
<td>166</td>
<td>154</td>
</tr>
<tr>
<td>Average crew size</td>
<td>2.1</td>
<td>2.4</td>
<td>4.1</td>
<td>6.6</td>
</tr>
<tr>
<td>Landings per days at sea (lb)</td>
<td>-</td>
<td>696</td>
<td>2,502</td>
<td>10,373</td>
</tr>
<tr>
<td>Revenue per days at sea (US$)</td>
<td>-</td>
<td>564</td>
<td>1,914</td>
<td>4,870</td>
</tr>
<tr>
<td>Total revenue (US$ million)</td>
<td>0.4</td>
<td>28.2</td>
<td>83.1</td>
<td>65.2</td>
</tr>
</tbody>
</table>

Source: Roundtree et al. (2001)

Walden and Kirkley (2000) conclude from their analysis that the New England fleet in 1996-98 had the ability to catch much more than they did. For example, the top performing 128 vessels could have taken the whole 1998 cod quota of 6,500 mt, representing only a quarter of the active otter trawlers in that year. This indicates that given stock conditions and the regulatory environment, excess capacity exists in the New England otter trawl fleet. Their analysis also shows that the larger vessels were better placed to operate in the fishery as they were able to take advantage of fishing opportunities further offshore during periods of seasonal closures on Georges Bank.

The commercial fisheries in the northeast Atlantic produced domestic landings worth US$1.1 billion dockside in 1999, representing total landings of 636,000 mt. These figures indicate a decrease in landings of over 20% since 1995 (Roundtree et al. 2001), a further indicator of the problems currently being faced by the industry.

### 2.5. Scotia-Fundy fleet

The Canadian fleet that harvests groundfish on eastern Georges Bank (area 5Zjm) is part of a larger fleet based in the Scotia-Fundy region. The groundfish fishery in the Scotia-Fundy region is composed of three major components: an inshore component
using vessels smaller than 45ft, a midshore component using vessels between 45ft and 65ft, and an offshore component which include vessels larger than 65ft. Since the 1980s, the distinction between the midshore and offshore components has become less obvious as technological improvements have allowed smaller vessels undertake offshore operations. Vessels smaller than 45ft use mainly fixed gear. Vessels from 45ft to 65ft use either fixed or mobile gear. The inshore vessels tend to be independently owned, while larger processing companies more typically own offshore vessels.

The Scotia-Fundy groundfish fishery takes place throughout the year with fishers adjusting the timing of the fishery based on local abundance, weather and market conditions, and on interactions with other fisheries (e.g. lobster). A long standing spawning closure and current management restrictions on Georges and Browns Banks has limited activity to the latter half of the calendar year only (June to December). Cod and haddock were the main species that were fished historically, but a yellowtail flounder fishery that was established in the early 1990s continues to expand. Because of the low cod quotas, cod are currently only being taken primarily as bycatch in the directed haddock fishery.

The Eastern Scotian Shelf fisheries for cod and haddock were closed in 1992 and remain under moratoria. The Western Scotian Shelf groundfish fishery is presently being fished by the inshore fleets, both fixed and mobile gear. Primarily the inshore fleet is also currently fishing Georges Bank groundfish resources. Although important for the mobile gear fleet, the small longliners make many more trips. The offshore fleet fishes in waters outside the Scotia-Fundy region.

### Table 4. Number of vessels in the Scotia-Fundy region, 1985-99

<table>
<thead>
<tr>
<th>Year</th>
<th>&lt;35ft</th>
<th>35-45ft</th>
<th>45-65ft</th>
<th>65-100ft</th>
<th>&gt;100ft</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>3,601</td>
<td>1,639</td>
<td>258</td>
<td>53</td>
<td>116</td>
<td>5,667</td>
</tr>
<tr>
<td>1986</td>
<td>3,598</td>
<td>2,026</td>
<td>254</td>
<td>66</td>
<td>114</td>
<td>6,058</td>
</tr>
<tr>
<td>1987</td>
<td>3,591</td>
<td>2,123</td>
<td>265</td>
<td>57</td>
<td>111</td>
<td>6,147</td>
</tr>
<tr>
<td>1988</td>
<td>3,525</td>
<td>2,209</td>
<td>281</td>
<td>53</td>
<td>108</td>
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<td>284</td>
<td>53</td>
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<td>2,125</td>
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<td>2,097</td>
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<td>219</td>
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<td>1997</td>
<td>2,634</td>
<td>2,031</td>
<td>206</td>
<td>38</td>
<td>63</td>
<td>4,972</td>
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<td>2,610</td>
<td>2,039</td>
<td>201</td>
<td>37</td>
<td>61</td>
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<td>1999</td>
<td>2,465</td>
<td>2,037</td>
<td>192</td>
<td>36</td>
<td>57</td>
<td>4,787</td>
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<tr>
<td>1985-99</td>
<td>-32%</td>
<td>+24%</td>
<td>-26%</td>
<td>-32%</td>
<td>-51%</td>
<td>-16%</td>
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Source: DFO (2002)
The fishing fleet appears to have been substantially reduced throughout the 1980s and 1990s. The reductions in the large offshore vessels are apparent as smaller, and more modern and flexible vessels have started to fish offshore. The general decline in fleet size can be attributed to overall reductions in fishing opportunities as well as probable concentration of quotas in fewer hands under the Enterprise Allocation and Individual Transferable Quota systems (quota property rights). It must be noted, however, that this fleet evolution reflects all fisheries, and not just vessels fishing groundfish.

### Table 5. Characteristics and revenue data for Scotia-Fundy vessels, 1999

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<th>Nova Scotia</th>
<th>New Brunswick</th>
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<tr>
<td>Number of vessels</td>
<td>4,179</td>
<td>608</td>
<td>4,787</td>
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<tr>
<td>Number of fishers</td>
<td>11,598</td>
<td>1,720</td>
<td>13,318</td>
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<td>Groundfish landings (mt)</td>
<td>68,098</td>
<td>405</td>
<td>68,503</td>
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<tr>
<td>Groundfish landings (US$ 1000)</td>
<td>53,899</td>
<td>541</td>
<td>54,440</td>
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<tr>
<td>Total landings (mt)</td>
<td>284,703</td>
<td>54,061</td>
<td>338,764</td>
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<tr>
<td>Total revenue (US$ million)</td>
<td>364.4</td>
<td>27.6</td>
<td>392</td>
</tr>
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</table>

Source: DFO (2002)

During the period 1988-96, fishery landings in the Atlantic region declined from 1.4 million mt, valued at US$642 million, to 680,000 mt, valued at US$710 million, a decrease of 51% in volume (DFO 2002). The decrease in landings was attributable to declines in both groundfish and pelagic species owing to reduced quotas as well as to the collapse of the northern cod fishery and its subsequent closure in 1992. As a result, employment in the industry in the Atlantic region has dropped from 28,300 fishers and plant workers in 1988 to about 21,550 in 1996, a decline of 24% (DFO 2002). This would indicate that the introduction of quota property rights has failed to curb the general decline of the fishery. There has, however, been no specific analysis of the balance between fleet capacity and resource availability, and hence little can be said about current capacity levels.

### 3. Conservation and management: ICNAF and EEZ

#### 3.1. ICNAF

In 1949 the International Convention of the Northwest Atlantic Fisheries was signed, establishing the International Commission for the Northwest Atlantic Fisheries (ICNAF). ICNAF’s main purpose was to manage fisheries and coordinate research. Despite that the regulations imposed by ICNAF were not binding on member states who objected to them, they did recommend measures to keep the stocks at a level
permitting the maximum sustainable yield (MSY). Early measures included open and
closed seasons, mesh size restrictions and spawning closures.

At ICNAF’s 1969 annual meeting a Total Allowable Catch (TAC) was proposed for
cod and haddock, which became effective in 1970. At the 1970 annual meeting, the
United States also proposed a TAC for yellowtail flounder in Georges Bank waters
and minimum mesh size regulations. These proposals became effective in 1971. Two
seasonal closures were also established on Georges Bank, beginning in 1970. The ar-
 eas were closed to most gears capable of catching groundfish (although hook gear and
scallop dredges were allowed). The two areas were configured explicitly to protect
the two spawning components of Georges Bank haddock, so as to minimise disrup-
tion of breeding activities. The area boundaries changed over time in response to per-
ceived fluctuations in the spawning grounds occupied by the stock and management
concerns for other resources.

Despite the actions taken by ICNAF, haddock stocks continued to decline. In 1972
the entire directed fishery was closed, and the TAC was set at zero. After several pro-
posals by the US for total fishing effort limitations, in 1973 ICNAF finally accepted a
management scheme proposing a multiannual TAC phase in. At the same time, lim-
ited entry licensing was introduced to the large trawler fleet. By 1974 TACs for 18
major stocks had been set, all with national allocations, of which were later revised to
allow for bycatch. The early TACs were set on the concept of using a fishing mortal-
ity that would provide the MSY. This meant that the catch was calculated to be equal
to the maximum possible production of the biomass. However, many stocks had al-
ready been fished too hard and the TACs based on this concept did not prevent further
debates. In 1977, ICNAF recommended that the TAC for the Georges Bank cod
stock be set at $F=0.1$.

### 3.2. Extended fisheries jurisdiction

The Third United Nations Conference on the Law of the Sea (UNCLOS 1973) led to
a consensus on the regime of extended coastal state fisheries jurisdictions. In 1976 the
US established the Magnuson Fishery Conservation and Management Act (Magnuson
Act), which eliminated all foreign vessels from US waters except those with approved

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1 This refers to the fishing mortality applied to a stock (i.e. the percentage of the biomass taken
every year). In other words, the point at which each additional unit of effort in the fishery is only
one tenth as productive as the first unit of effort applied to the fishery in its unexploited state.
fishery agreements. The first Canadian Atlantic Groundfish Fishing Plan was announced in December 1976. Both provided the infrastructure to adopt and manage fishery resources within Exclusive Economic Zones (EEZs). On January 1, 1977 Canada was the first to embrace the 200-mile EEZ and the Department of Fisheries and Oceans (DFO) began to regulate groundfish fisheries in the region. The US followed suite, and in March 1977 the Magnuson Act took effect and domestic fisheries management in offshore waters out to 200 miles was also established. As soon as the US and Canada extended their fisheries jurisdiction, they withdrew from ICNAF. With these withdrawals along with several other countries, ICNAF was no longer a viable international organisation.

The Magnuson Act created eight Regional Fishery Management Councils charged with managing fishery resources and implementing these goals in coordination with the National Marine Fisheries Service (NMFS). The New England Fishery Management Council's (NEFMC) jurisdiction extends from Maine to Southern New England, which includes a large portion of Georges Bank.

Figure 6. EEZ of Northeast USA

Source: NEFMC
In Canada, the federal government created a fairly centralised management system where all fishing within the extended fisheries jurisdiction is administered through the DFO, in six administrative regions. The Maritimes Region incorporates the Scotia-Fundy Region, which is responsible for NAFO management areas 4V, 4W, 4X and 5Ze (cf. Figure 7).

**Figure 7. Management areas of Atlantic Canada**

Source: Burke et al. (1996)

### 3.3. Maritime boundary delimitation

Despite good management and conservation efforts by the US and Canada it stirred up one important, but basic question. Where lay the legal maritime boundary between the two fishing zones? The US based its case on the morphology of the shelf and natural divisions among fish stocks. In the Gulf of Maine, the US argued that Georges...
Bank was a natural prolongation of New England’s continental shelf and that ecological boundaries occurred there, such that the 200-mile zone extended through the Northeast Channel and put the whole of Georges under their control. The US argued that such a boundary would create the fewest possible transboundary stocks, and in this way the Northeast Channel line would facilitate fishery conservation and management.

Canada, who had originally claimed jurisdiction over the north-eastern third of Georges Bank, a claim connected with geologic exploration permits in connection with the lease of oil rights as early as 1965, rejected the US arguments. Their claim was based on an equidistance line, and argued that this was the equitable choice. A disputed zone existed between the two claims, within which lay incredibly rich and productive fishing grounds.

In February 1977, Canada and the US signed the Interim Reciprocal Fisheries Agreement. A second Interim Agreement replaced this agreement in April 1978 (Herbert 1995). The primary intent of both agreements was to preserve the fisheries status quo in the Gulf regions disputed zone. They also provided bilateral access to each country’s undisputed zone based upon traditional fishing patterns. By June 1978 it became evident that the interim nature of these agreements were ineffective, and Canada suspended any provisional agreements based on the assertion that the US was not maintaining existing arrangements. Each country's fishers were subsequently banned from the others undisputed fishery zone, and competitive overfishing pursued.

Negotiations for a comprehensive fisheries agreement became a priority for both governments after the collapse of the 1978 Interim Agreement. In March 1979, two agreements were signed for the fisheries and boundary dispute. The first one was the East Coast Fisheries Bilateral Agreement (ECFA). This provided an incentive for both countries to agree to a boundary settlement. The second agreement was a Treaty between the US and Canada to submit to a binding settlement for the delimitation of the maritime boundary in the Gulf of Maine. However, major opposition to the ECFA occurred throughout the New England fishing industry, particularly with concerns about the confidence in the legal claims of the US to Georges Bank. Despite Canadian protest, the US Senate eventually adopted a resolution to delink the two agreements.

On the 20th November 1981 the two governments eventually agreed to submit the dispute over the maritime boundary to adjudication by the International Court of Justice (ICJ). In October 1984 the Special chambers judgment was announced. The ICJ
boundary, which today is commonly referred to as the Hague Line, is approximately 480km in length and is located between the former boundary claims of both countries (cf. Figure 6). The court had decided on a compromise, assigning the Northeast Peak of Georges Bank to the Canadians. The ICJ however, left a vital question unresolved. How were fish stocks to be managed that straddle the boundary or migrate over it?

4. New England fisheries management system

In 1977 the NEFMC proposed a Fishing Management Plan (FMP) for cod, haddock and yellowtail flounder that included existing minimum mesh size restrictions, closure of spawning grounds and the TAC limits set by ICNAF. The FMP went into effect in March 1977, as part of the federal management scheme for the EEZ established under the Magnuson Act. No foreign fishing was permitted under the plan although Canada continued to fish on Georges Bank in portions of the Gulf of Maine under the 1977 Interim Reciprocal Fisheries Agreement. In July 1978 the FMP was amended to establish NAFO management areas 5Y and 5Z as separate management units for TAC regulation.

During the period from 1977-80, industry reactions to these management measures were strong. Due to perceptions that the management measures were too restrictive given the absence of foreign harvesting competition, many fishers discarded fish or landed fish in excess of quotas without reporting them, and misrepresented their catches. In response the New England Council developed an Interim Management Plan (1982) for cod, haddock and yellowtail flounder until a longer-term plan for the overall multispecies fishery was developed. Under the Interim Plan management measures were much less restrictive than previous trip limits and quotas, and did not provide for any TAC regulation. It turned to input controls such as area/season closures, mesh size and trip limits for regulation.

In 1986 the Northeast Multispecies Fishery Management Plan (NMFMP) was agreed upon. It was based on the size of the reproductive stock, emphasising the maintenance of stock spawning potential. In promoting a multispecies fisheries approach to harvesting, it rejected the use of TACs, quotas and limited entry for the achievement of its management objectives and retained indirect input controls from the previous Interim Plan as the primary management tools. Partitioning of Georges Bank into US and Canadian zones also resulted in changing the configurations of the ICNAF designated closed areas. The closed areas in US waters were extended spatially in some years and temporally from January through June. Closed areas for the protection of
yellowtail flounder were also instituted with the advent of the NMFMP. A seasonal closure was established from March through May in an irregularly shaped area off the southern New England coast, extending from east of Nantucket Island westward to the waters south of eastern Long Island, New York.

In 1992 Amendment No.5 to the NMFMP marked a change in philosophy of groundfish management in New England. It included more direct controls on effort and fishing mortality, such as a gradual reduction in the amount of Days-at-Sea by fishing vessels. In 1996 the New England Council implemented Amendment No.7 to the FMP to accelerate Amendment No.5 mortality reduction and to initiate rebuilding schedules for depleted stocks. Target TACs were also first introduced in this amendment. Under Amendments Nos.5-7 of the plan, effort was reduced by 50% for most of the mobile gear fleets, three large areas on Georges bank and in Southern New England were closed, minimum mesh sizes were increased, a moratorium on new vessel entrants was enacted, and trip limits for haddock, and later cod, were implemented, as were a number of additional regulatory and administrative measures.

At the end of 1995 a number of recommendations were made to change the Magnuson Act to address specific problems with the current fisheries management procedures. It was renamed the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) when amended in October 1996. The amendments to the Magnuson-Stevens Act are known as the Sustainable Fisheries Act (SFA). They focused on the incorporation of habitat protection as an explicit consideration in fishery management.

Amendment 9 was implemented in November of 1999 to bring the FMP into compliance with the SFA. The SFA had many significant changes from the previous Magnuson Act including a redefinition of optimum yield\(^2\), and definitions of ‘overfished’ and ‘overfishing’. It incorporated biological reference points and harvest control rules and defined target and threshold fishing mortality and biomass levels. ‘Overfishing’ was defined in terms of \(F_{\text{MSY}}\)\(^3\) and ‘overfished’ was defined in terms of \(B_{\text{MSY}}\).\(^4\) Amendment 13 is currently under development to implement rebuilding schedules to continue to bring the FMP into compliance with the SFA. The objectives

\(^2\) The yield from a fishery which provides the greatest overall benefit to the nation with particular reference to food production and recreational opportunities; it is based on MSY as modified by economic, social or ecological factors.

\(^3\) Fishing mortality rate at MSY

\(^4\) The biomass at MSY
are to specify rebuilding schedules for overfished stocks and to specify maximum fishing mortality rates to promote rebuilding.

US fisheries regulators recently announced new temporary restrictions on cod fishing in New England as they work to comply with a court order to permanently protect depleted groundfish stocks (WorldFish Report 2002). The measures proposed by the NMFS include additional fishing area closures, new restrictions on fishing gear (e.g. larger mesh sizes), and a significant reduction in the number of days fishing vessels can work. A key element in the plan is a 22-day limit on fishing days in the Gulf of Maine between May and October, when cod are massing to spawn. They also include the expanded use of government observers on commercial fishing vessels to monitor bycatch.

5. **Scotia-Fundy fisheries management system**

The two most important statutes governing fisheries management in Canada are the Fisheries Act (1970) which gives the Minister of Fisheries and Oceans the authority to issue fishing leases and licenses, and the Coastal Fisheries Protection Act (1970) that grants the Cabinet the authority to prescribe the conditions under which foreign fishing vessels enter Canadian waters. Since 1977, with the declaration of exclusive economic zone the Canadians embraced output controls, principally catch quotas for regulation and developed reporting and monitoring systems to support it.

An Atlantic Groundfish Fishing Plan is developed every year for the harvest of groundfish resources based on a fishing year of April 1 to March 31. A central element of the Plan is to harvest the resource at a rate no greater than $F_{0.1}$. However in the mid 1980s the Canadian Government observed that a strict application of the $F_{0.1}$ concept could lead to drastic changes in TAC levels between successive years. In order to minimise the negative socio-economic impacts of such drastic reduction in TACs between years, a rule was established by which catches at $F_{0.1}$ would be phased in over time. This rule, often referred to as “the 50% rule” stipulated that the fishing mortality in the coming year of the plan would be set at a value half way between the current fishing mortality and $F_{0.1}$.

TAC controls were retained as the primary method for control of the exploitation rate. Subsequent annual plans introduced even greater sub-allocation of TACs to interest groups defined predominantly by vessel length and gear used. Limited entry licensing was also extended to all groundfish vessels. The Sector Management Policy that re-
stricted inter-regional mobility of boats less than 65ft was introduced in 1982. In other words, inshore fishers could only fish in their regional sector.

In the early 1980s a policy review was conducted in response to a financial crisis in the fishing industry. One of the major outcomes of this crisis was an experiment to lower costs to large offshore trawler through a system of Enterprise Allocations (EAs). Under this system, individual companies or enterprises received quotas for every species of fish in an attempt to reduce effort and resulting costs. They had extended to the entire >100ft (offshore) groundfish fleet by 1984 and to both the mobile and fixed gear 65-100ft (mid-shore) fleets by 1988. Today, EAs are fully transferable for most species and temporary quota transfers are permitted. There are also a series of competitive and bycatch pools for some of the smaller companies.

In the late 1980s in response to declines in stock abundance and an increase in catching capacity of inshore fleets, a regional task force recommended improvements to fleet management. In 1991 quasi-property rights for the inshore mobile gear fleet was introduced, known as Individual Transferable Quotas (ITQs). Today, most inshore mobile gear vessels are part of the ITQ fleet. This group has fully transferable individual vessel quotas for cod and haddock. There is in addition, a small fleet of mobile gear vessels known as the Generalists Fleet that have chosen to fish their combined ITQs as fleet quotas. Generalists retain the option of moving to the ITQ fleet and is currently half of the size established in 1991.

Fixed gear vessels of 45-65ft fishing from Nova Scotia ports established an ITQ programme in 1997 and the New Brunswick portion of this fleet adopted a separate ITQ system in 1998. These fleets have fully transferable individual quotas for cod and haddock. Since 2000, temporary quota transfers have been permitted between the mobile and fixed gear fleets. In recognition that an efficient and timely means of monitoring landings was an essential feature of an ITQ system, DFO introduced the Dockside Monitoring Program to verify and report landings on a timely basis. Today, fishers’ organisations are now required to contract, at their own expense, independent monitoring companies to carry out dockside monitoring.

The <45ft Fixed Gear (FG<45ft) fleet operated under an overall quota that was harvested on a competitive basis until 1996 when community management was introduced. Community management was first introduced on a trial basis in Halifax West, Sambro, Nova Scotia in 1995. This fleet was allocated a separate fishing quota and fished competitively until the quota was filled. At the same time as the community
management project, the remainder of the FG<45ft sector established a quota allocation system based on the three gear types of handline, longline and gillnet. This approach proved to be unsuccessful, and based on the success of community management, the FG<45ft community of the Scotia-Fundy region decided to follow the community-based approach. It was extended annually for 1997 and 1998 and then for a five-year period within each Community Management Board (CMB).

In NAFO management areas 4X and 5Z the FG<45ft groundfish quotas have been divided into seven geographic groups currently managed by eight CMBs. CMBs are responsible for distribution of catch allocations and development of in-season management plans. Today, each CMB develops a Conservation Harvest Plan (CHP) for controlling fishing activities and adopting standardised monitoring and catch controls. Quotas allocated to each of the CMBs are on the basis of catch history of each individual using the 1986-1993 period. Each board develops harvesting plans primarily for three gear sector quotas, i.e. handline, longline and gillnet. Seasonal quotas and industry monitored trip limits are also established for each of these groups. CMBs can trade quota among communities, trade or exchange members, and apply penalties for breach of violations of CHPs.

Following the demise of cod resources in most parts of the Atlantic in 1992-93, widespread closures were implemented in the 1990s. Currently Browns Bank and Georges Bank have spawning closures, the duration of which depends on the specific CHP for the individual fleets. The closures tend to fall sometime between February and June, effectively eliminating harvesting of pre and post spawning aggregations during the first half of the year. These closed areas provide significant, year-round protection from fishing for the western spawning components of cod and especially haddock. During the last number of years several license removal schemes, including Atlantic wide buy-back and early retirement programmes, have been developed with the aim of reducing licensed capacity by 50%.

6. Development of cooperative management measures

Since the implementation of 200-mile jurisdiction and the international boundary, fisheries management authorities of both the US and Canada have sought some form of cooperative management of the transboundary fish stocks on Georges Bank (area 5Zjm). However, it was not until April 1998 that the first Transboundary Resource Assessment Committee (TRAC) was established as a combined Canada/US peer review process for transboundary stock assessments. They have been held every year
since and provide a forum for the joint Canada/US peer review of the status of the Georges Bank cod, haddock and yellowtail resources.

The TRAC process consists of working groups and meetings, and produce peer-reviewed assessments, the Stock Status Reports (SSRs) for Canada and the Advisory Reports for the US. It is important to note that these meetings only consider resource status and are not concerned with management issues such as allocation questions or differences in management systems. In Canada, the SSRs are used to make harvest and management recommendations to the DFO. In the US, the Advisory Reports are used by the Multispecies Monitoring Committee of the NEFMC to help develop harvest and management advice the following year. Further, the allowable fishing mortality rates established each year for the US fleet take account of the projected Canadian mortality, based on ‘status quo’ behaviour by the Canadian fleet (Walden 2002, personal communication).

In 1999, the Transboundary Management Guidance Committee (TMGC) was formed to develop a joint management advisory process for both Canada and the US. Some of their objectives included recommending harvesting strategies, resource sharing, and harvest levels, which were consistent with US and Canadian objectives. In December 2001 the TMGC agreed upon a proposal that they could recommend to administrators. It accounted for historical utilisation and adapts to shifts in resource distribution. The sharing agreement applied to the following management units: haddock 5Zjm, cod 5Zjm (eastern Georges Bank) and the entire Georges Bank (5Z) yellowtail flounder. The proposed starting date for the agreement is 2003, with the end of the transition to a 90/10 weighting formula in 2010.

7. Discussion and concluding remarks

Similar to many other global fisheries, the groundfish fishery on Georges Bank appears to be showing signs of overcapacity. The declining trends in landings and revenues of the late 1980s and 1990s, and poor recruitment to the overall biomass, seem to support the view that the industry is currently overcapitalised. The need for continued strengthening of gear restrictions and closed areas/seasons, and the existence of government subsidy programmes, further indicate the poor status of the fishery. However, slight improvements in both landings and biomass for haddock and yellowtail flounder in 1999 and 2000 give some reason for optimism. The overall picture for Atlantic cod is rather bleak, however, and hopes for a quick recovery are few and far between.
Despite many years of cross-boundary cooperation in the management and conservation of transboundary fish resources, the resources associated with the boundary have been subjected to two entirely different systems and levels of exploitation. For migratory transboundary stocks, such as cod and haddock on Georges Bank, the lack of coordination and compatibility between the two management systems has led to a state of severe overexploitation. In addition, the presence of important spawning grounds for cod and haddock along the boundary compromises spawning potential, increasing the probability for major recruitment failure in the region. However, it appears that it is the failure of US fishery management council system to manage the fishery, rather than any lack of cooperation with Canada, that has impacted resources. The councils have not only failed to manage the resources adequately, but they have probably also undermined the Canadian attempt to manage their resource by maintaining US harvest at excessive levels (Walden 2002, personal communication).

Further conclusions that emerge from an examination of the management philosophies, procedures, and plans of the US and Canada are that there are significant differences on all levels. The legal and administrative framework differs in a number of significant respects. The federal government has primary management responsibility in Canada. The US fishery management system reflects a more decentralised political atmosphere where industry members have a strong voice through the regional council system. The states have a strong representation as well, largely because the US states unlike the Canadian provinces have a significant amount of fishery management responsibility. State jurisdiction extends to three miles in the US, whereas the federal government in Canada has sole jurisdiction from the coast out to 200 miles.

In addition to policies and regulations directly aimed at conservation, other policies and regulations affected conservation. A minimum fish size was introduced in the late 1980s to prevent landing cod too small for profitable processing. The minimum fish size was incompatible with the minimum mesh size and led to widespread discarding. Trip limits were introduced in some fisheries to spread catches over a longer period and over more vessels. Trip limits exacerbated difficulties in balancing quotas in multispecies fisheries. Further, by applying restrictions on days at sea, the US management system has seemingly encouraged capital to remain in the fishery, with fishing vessels continuing to operate at probably sub-optimal levels. Hence, long term restructuring of the fleet has not materialised, although vessels are likely to have altered their input and cost structures in response to lower groundfish availability (Walden 2002, personal communication).
The introduction of EAs and ITQs in Canada led to increased dumping and highgrading, and it also appears that the system has not had the desired effects of sustainable harvest levels and economic efficiency. However, this can at least in part be attributed to the difficulties faced with the management of a transboundary resource. For example, the ownership of the property rights have probably been regarded as rather insecure in the light of externality effects, and thus the long-term ‘investment behaviour’ of quota owners in stock rebuilding may not have materialised. However, the lack of specific fleet data for the groundfish fishery has not permitted a comprehensive analysis of fleet adjustment in response to ITQs and fluctuating resource levels.

Government programmes, subsidy and loan programmes, have encouraged increases in harvesting and processing capacity and encouraged fishers to remain in the fishery. In October 2000, the NEFMC Ad-hoc Capacity Committee expressed that two-thirds of the allocated days at sea in the New England fishery were not being used and a fishing mortality reduction was still needed in many stocks in the multispecies complex. This evidence points to the clear existence of excess capacity in the fishery (NEFMC 2002). The current goals of the Committee include the development of proposals, which will reduce excess capacity in the multispecies fishery, and allow for the creation of a management system with a fleet capacity that is commensurate with economic efficiency, biological conservation and species diversity. A range of proposals have been outlined and include provisions that would allow fishers to reduce unused fishing effort, increase flexibility and consolidate fishing effort and/or increase flexibility in ways that might reduce either latent or excess fishing capacity. The Committee believes that flexibility, by changing permit restrictions, could provide incentives for reducing the number of vessels in the fishery (NEFMC 2002).

It is evident from this paper that the groundfish fishery of Georges Bank has undergone considerable change since the years of ICNAF. The evolution of the fishery has seen a general decline that can be linked to years of overexploitation and problems with managing the transboundary and migratory resource in a cooperative and efficient manner. With increased attention given to the problem of overcapacity on a global basis, and the expansion of cooperative management in the region, it is likely that the management problems experienced in the past will not be revisited as the US and Canadian management authorities refine their approaches to effective management. Indeed, some signs of haddock and yellowtail stock recovery are apparent, although this can mainly be accredited to tight management restrictions currently in place. Hence, it is probably too early to predict whether this recovery would be able to sustain a viable fishery in the long term given the current levels of fleet capacity in the Georges Bank groundfish fishery.
References


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