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Management of the Canadian Shrimp Fishery

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Abstract

The Canadian northern shrimp fleet has been cited for its responsible fishing practices and for its success in resource conservation and sustainable economic development. The northern shrimp fishery has been managed conservatively since its inception with sustainable development being the guiding principle. Quotas increased slowly in the early years of the fishery and exploitation rates remain low. Canada implements an elaborate management scheme for northern shrimp with tight controls on quotas, vessels, gear and landings, including 100% observer coverage in the offshore factory freezer fleet. The offshore fishery is rights-based with license holders held to strict Enterprise Allocations per company. The inshore quota is fished competitively among participating vessels with quota being assigned on a coastal community basis. Penalties and license sanctions are severe for violators. Great strides have been made in technological development including gear selectivity, bycatch control, size selection, etc. The fishery is based primarily on a single species, *Pandalus borealis* (northern pink shrimp) and takes place off eastern Canada from 49°N to approximately 63°N. A second species, *Pandalus montagui* (striped shrimp), is commercially less important and is fished in limited quantities. The commercial fishery began in 1978, developed slowly until 1986 when catches began increasing. Since 1996, quotas have increased rapidly from some 36 000 mt in 1996 to approximately 90 000 mt in 1999. Scientists believe the shrimp resource to be comprised of a single stock or stock complex although there are differences in rates of growth and maturation across the geographic range of the species. These differences provide the basis for delineating assessment and management units. Stock status, especially in the southern areas, is very favourable with high biomass of male and female components. The offshore fishery is prosecuted by thirteen offshore factory freezer trawlers. All of the offshore catch is processed and frozen on board as either cooked or raw product. The inshore fishery is prosecuted by some 350 vessels landing fresh product to shore plants for cooking and peeling. Major markets are Asia, Europe and the U.S

Introduction

The northern shrimp resource in Atlantic Canada is distributed from Davis Strait in the north to the Scotian Shelf to the south. There are three distinct fisheries:

1. The Gulf of St. Lawrence fishery - Total Allowable Catch (TAC) of 23,500t;
2. The Scotian Shelf fishery - TAC of 5,000t and;
3. The Northern Shrimp fishery - TAC of 103,000t.

It is third fishery noted above which is the subject of this paper.

The Northern Shrimp fishery occurs along the East Coast of Newfoundland and Labrador to the Davis Strait, within NAFO Subareas 0, 1, 2 and Division 3K, and is based primarily on a single species, *Pandalus borealis* (Northern or pink shrimp). *Pandalus borealis* is one of several cold water shrimp species found north of latitude 40° N in the Atlantic, Pacific and Arctic oceans. A second species, *Pandalus montagui* (striped shrimp), is commercially less important and is fished in limited quantities primarily at the confluence of the Hudson and Davis Straits in NAFO Division 0B.

The shrimp resource in the northern area is believed by scientists to comprise a single stock or stock complex. Nonetheless, there are differences in rates of growth and maturation which are attributable to different habitat conditions across the geographic range of the species. These ecological differences provide the basis for delineating discrete management and assessment units. There are six such units, called Shrimp Fishing Areas (SFA), which vary considerably in their contribution to the commercial fishery (Fig 1).

In brief SFAs 4, 5 and 6 are the principal fishing grounds and will account for over 80% of the total catch in 1999. In general, these areas sustain higher catch rates and larger shrimp. SFAs 0, 1, and 3 are not as heavily exploited. SFA 0 presents formidable ice and weather conditions and has attracted little effort from the Canadian fleet. SFA 1 has not performed well in several years, (although preliminary 1999 results seem better) and effort in SFA 3 is directed toward the *pandalus montagui* stock which is of lower value. SFA 2 has rebounded in recent years and, while the TAC has been increased in that area for 1999, catches have been variable.

Development of the Fishery

The history of the northern shrimp fishery can be traced to the early 1970s when an exploratory fishing program confirmed the presence of shrimp stocks from Baffin Island southward to the northeast coast of Newfoundland.

Following this period of exploratory fishing, a commercial fishery began in 1978 with the issuance of eleven licences. A twelfth licence was added in 1979. Early results were encouraging, but generally weak markets during the mid-1980s caused landings to decline to levels well below those experienced in 1980 and 1981. Annual catches had increased to about 9,000 tonnes in 1981 but then declined to only 3,000 tonnes in 1984. This was also a period of adjustment as licence holders sorted out how best to approach the fishery.

During this learning period many licence holders reduced their risk by using foreign vessels to harvest their allocations, though government policy intended that the industry become fully Canadian by some point. By 1986 market conditions had improved and the industry responded with substantially increased fishing effort and catches. Four more licences were issued in 1987 as a result of improvements in the fishery, bringing the total to sixteen. Of these sixteen licences, six involved the use of foreign flag vessels. That same year the Department of Fisheries and Oceans (DFO) stipulated that all licence-holders would have to use Canadian flag vessels by 1990. All vessels in the fishery are now registered in Canada and carry Canadian crews. A seventeenth licence was issued in 1991.

Thirteen large, offshore trawlers currently fish the 17 offshore northern shrimp licences. These vessels use small-meshed otter trawls which are fitted with sorting grates to avoid by-catch while retaining the shrimp. All of the catch is processed and frozen on board as either cooked or raw product.

In the late 1980's, an individual rights-based management strategy was developed for the offshore fleet. The total allowable catch (TAC) for each fishing area was divided among the 17 offshore licences and assigned as licence quotas or Enterprise Allocations (EA). This management approach has been a major factor in the development of an economically stable offshore fleet where resource availability is in balance with vessel capacity.

Annual catches have steadily increased since 1984, with the 1998 catch of approximately some 80,000 tonnes being the highest recorded. This increase was due to continued high abundance in the traditionally fished areas and the discovery of new fishing grounds in NAFO Divisions 0B, 2G, 2J and 3K.

The year 1997 ushered in a new era of unprecedented abundance of northern shrimp with TACs being increased several fold. The TAC went from some 37,000 mt in 1996 to around 102,000 in 1999.

Beginning in 1997, new access was provided to smaller, inshore vessel owners on a temporary basis while resource abundance remains high. If quotas decline in future years back down to 1996 levels, these temporary entrants will leave the fishery.

Structure of the Harvesting Sector

The offshore fleet is comprised of 13 factory freezer trawlers. All are relatively new, with eight having been built within the past 12 years. Most are purpose-built for shrimp trawling and processing, though some are also able to process and freeze groundfish. They range in length from 49 to 74.3 m, with hold capacity ranging from 400 to 1,960 m³. All product is frozen-at-sea, head-on, shell-on for the Asian and European markets. The TAC for the offshore fleet in 1999 is around 56,000 mt of *pandalus borealis* and 3,800 mt of *pandalus montagui*.

Offshore fleet activity varies by month and area. SFAs 1 and 2 are Summer-Fall fisheries. SFA 4 is fished almost year round, with activity peaks in June and September. SFAs 5 and 6 are fished all year with the highest effort levels from April to December in SFA 5 and January to April in SFA 6.

Fishing trips generally last until the hold is full, a period ranging from 25 to 55 days depending on catch rates and hold capacity. The number of fishing days by the larger, more modern vessels ranges from 270-320 while making 6-8 trips per year. The smaller vessels fish for 200-250 days, making 8-10 trips per year.

The temporary inshore fishery is new, having begun in 1997. The sector is composed of some 300 otter trawlers (draggers), all less than 20 meters. The catch of this fleet is landed fresh to peeling plants located in the Province of Newfoundland and Labrador. The fishery is exclusively for *pandalus borealis* and the TAC for 1999 is around 43,000 mt. The inshore fishery is managed under competitive quotas, with all vessels subject to trip catch limits. The fishing season runs from June to November, with fishing trips typically lasting 5 days.

Management Strategy

The long term objectives of the northern shrimp fishery include resource conservation, orderly development, fair and equitable access and the development of a self sustaining industry. Considerable progress has been made toward the realization of these objectives, especially in the areas of resource conservation and industry stability. The offshore fleet has been economically sustainable for some time and is a significant contributor to the Canadian economy. The inshore fishery, still in its formative years, is beginning to reap considerable benefits to its participants.

A Quota management system based on the best and latest scientific advice has been the cornerstone of this fishery. A Total Allowable Catch is established annually for each SFA. Research vessel surveys are conducted twice a year. Literally hundreds of thousands of samples have been taken for analysis. This survey information is used to gain insight on trawlable biomass, sex and length frequency distributions, recruitment, and other biological variables. TACs are based on a conservative interpretation of the biomass estimates. Indeed, Canada's long term harvesting strategy has been a catch to biomass ratio near 10%. In SFA6, which is the most productive area, the 57,000t TAC corresponds to a conservative 12% catch to biomass ratio. It is believed that Canada can boast the most conservative exploitation for any shrimp fishery. It is further believed that this conservative approach is in part responsible for the healthy resource we enjoy today.

In addition to quota management, access to the inshore fishery is currently frozen and harvesting capacity is controlled. In the offshore, the number of licences has been frozen since 1991 and the EA system provides incentives to balance vessel capacity with resource availability.

An industry-government body, the Northern Shrimp Advisory Committee, composed of industry representatives, provincial government officials along with fishery scientists and managers from the DFO, provides advice annually to the Minister of Fisheries and Oceans on the management of the fishery including harvest levels. Following this process an "Integrated Fishery Management Plan" is developed and published. The plan outlines the details of the fishery including the latest science, the management strategy, individual management plans and enforcement and control measures for the various fleet sectors fishing the stock.

Management and Control of Fishing Activities

Regulatory Measures include the following:

- Mandatory 100% industry-funded observer coverage¹ for the offshore fleet.
- No less than 10% industry-funded observers coverage in the inshore fleet
- Mandatory 100% industry-funded dockside monitoring of inshore vessels.
- Random industry-funded dockside monitoring of offshore vessels
- Vessels are restricted to fishing to waters outside 12 nautical miles.
- Mandatory use of the nordmore grate with a maximum spacing of 28 mm in the offshore fleet and 22 mm in the inshore fleet
- Minimum trawl toggle and chain lengths (71 cm) for the inshore fleets
- Minimum mesh size of 40 mm
- Position and catch must be reported to DFO on a daily basis
- Accurate fishing and production logbooks and fish purchase slips must be completed and submitted to DFO
- Access is regulated by fishing licences, enterprise allocations, seasons, quotas and gear specifications.
- Fish processing vessels must be registered in accordance with the provisions of the *Fish Inspection Act* and *Fish Inspection Regulations*.
- The owner of the vessel shall make readily accessible on demand by an inspector any fish product on-board the vessel.
- The Department of Fisheries and Oceans must be advised of the point of offloading forty-eight (48) hours in advance.
- The landing of all shrimp is mandatory with the exception of small quantities which fall on the floor during processing (such discards are counted against the catch of the vessel)

Surveillance and Enforcement

The northern shrimp fishery is one of Canada's, and indeed the world's, most closely monitored fisheries. Air surveillance and 100% observer coverage along with daily hails of position and catch are the main enforcement elements for the offshore fleet. Vessels are required to hail their positions and catches on daily basis, thereby allowing real time monitoring. There is full (100%) observer coverage to ensure EAs fall within TAC levels, that there is no discarding and that gear restrictions are respected

DFO fixed wing surveillance is conducted in the more southerly areas and dedicated air surveillance patrols are conducted in northern areas in cooperation with the Department of National Defense.

Patrol vessel surveillance, 100% dockside monitoring and 10% observer coverage are the major tools used in the inshore.

Results

The results of a quota based management regime, replete with a comprehensive monitoring and compliance program, and a conservative harvesting strategy has been a very productive, healthy and economically viable northern shrimp fishery. Annual landings have increased steadily over a 20-year period. While the sharp increase in abundance in the northern shrimp resource in the past four years is attributed to many factors, it is unarguable that Canada's adherence to a conservative fishing strategy over the past twenty years has played a contributing role.

¹ While observer coverage is funded by the industry, the entire program is administered and controlled by the enforcement agency, the Department of Fisheries and Oceans (DFO). Private, arms-length observer supply companies deliver the service and detailed trip reports become the property of DFO.

The quota management rights-based Enterprise Allocation system of fishing in the offshore fleet has created long term economic viability of that fleet. The system provided a measure of security to the participants in that fleet which has led to developments not otherwise possible. It appears that, in Canada at least, the pace of resource development and responsible fishing practices is directly related to the degree of security to the resource - the more secure the access, the greater the degree of responsibility. The record clearly indicates that this type of fishing leads to responsible practices, conservative fishing, a growing or stable resource and development of new fishing opportunities.

Specifically, in the offshore northern shrimp fishery, the following initiatives have been undertaken by the industry at its own cost:

- developmental and exploratory fishing has greatly expanded the fishing grounds
- gear trials have led to the virtual elimination of groundfish bycatch
- cooperative industry-government relations including direct funding of scientific and technical programs
- innovative industry-driven gear selectivity research

The offshore fleet has been cited in government documents as “...the most conservation-oriented of any offshore shrimp fleet in the world.” and was the recipient of an environmental award in 1997 for its progress in groundfish bycatch control.

In addition, the system enables and encourages operators to continuously invest in quality enhancement and product development as opposed to catch maximization.

In summary, quota based management coupled with strict monitoring and control has contributed to making the Canadian northern shrimp industry among the world leaders in the production of coldwater shrimp. The management regime is effective and responsive, the resource is enjoying unprecedented abundance and the fishery continues to deliver increasing revenues to its participants.

TABLE 1. Northern Quota Summary 1996-99.

	1996	1997	1998	1999
Area 0	500	500	500	500
Area 1	8 500	8 500	8 500	7 650
Area 2	3 500	5 250	5 250	8 750
Area 3	1 200	n/a	n/a	n/a
Area 4	5 200	5 200	8 320	8 320
Area 5	7 650	15 300	15 300	15 300
Area 6	11 050	23 100	45 200	58 632
Total				
<i>Borealis</i>	37 600	57 850	84 070	99 152
<i>Montagui</i>	n/a	3 800	3 800	3 800

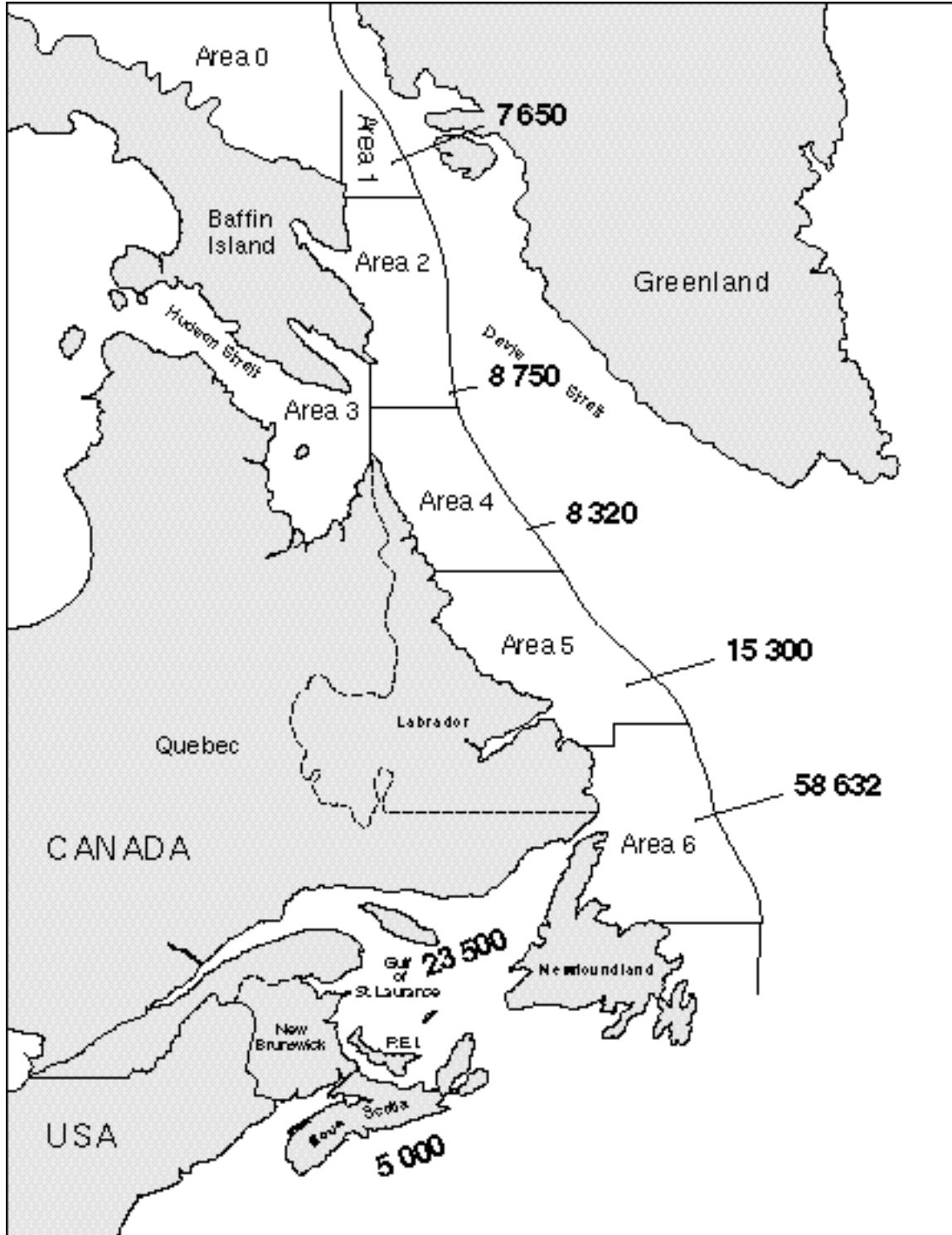


Fig. 1. Management and assessment units, called Shrimp Fishing Area (SAF), which vary considerably in their contribution to the commercial fishery.