

## Chapter 4



# The Atlantic Salmon Recreational Angling Industry: Economic Benefits

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### Introduction

Humans and Atlantic salmon *Salmo salar* have been interacting in North America for thousands of years. Human populations have grown; by contrast, both the productive capacity and the range of wild Atlantic salmon have been drastically reduced since European colonization (Watt 1988, 1989). Many factors have contributed to these declines, including overfishing, habitat destruction, blockage of migration routes with dams, and poor forestry and agriculture practices. Pressures continue on the remaining salmon populations, and returns of two-sea-winter (2SW) maiden Atlantic salmon to North America, which provide most of the eggs needed to seed the rivers, are now believed to be at the lowest levels ever recorded (ICES [International Council for the Exploration of the Sea] 2000; Figure 1). In 2000, in Maine, the U.S. Department of the Interior announced the listing of the Downeast River populations of salmon as endangered under the Endangered Species Act. In Canada, an endangered designation by the Committee on the Status of Endangered Wildlife in Canada is being sought for populations in rivers draining into the Inner Bay of Fundy (Kenchington 1999).

Economics can be a powerful force for conservation. People conserve the things from which they draw benefit. There is nothing new in this idea; it has been a central tenet of wildlife management since the early years of the science (Leopold 1933). The chances of successfully conserving and restoring species are greatly enhanced when people derive direct economic benefits from the species. The ideal situation occurs when market and conservation forces support each other.

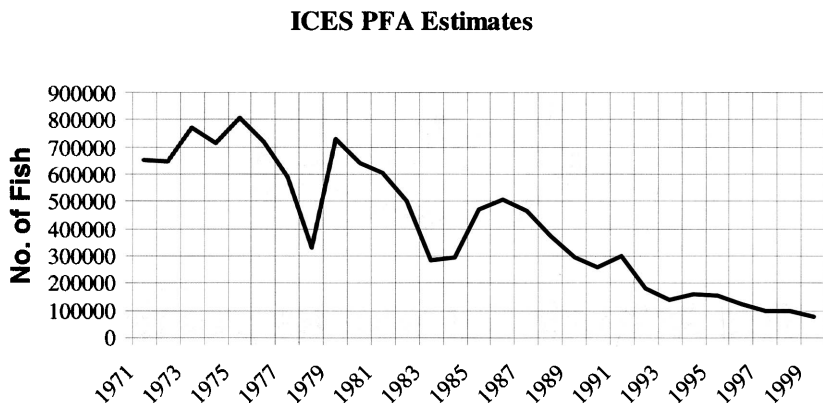


Figure 1. Estimates of the prefishing abundance (PFA) of North American origin salmon present in the ocean about seven months before they would return to spawn in their home rivers as multi-sea-winter salmon. Data from ICES (2000).

Given the importance of economic considerations as part of a comprehensive approach to salmon fisheries conservation, we were tasked with reviewing the literature and trying to assess the current value of the recreational fishery for Atlantic salmon. We are not economists, and this may be why we were asked to undertake the study. What was requested was an outsider's perspectives of the degree to which the Atlantic salmon functions as an economic engine, descriptions of what resources are being devoted to the engine's upkeep, and thoughts about the role of economics in salmon conservation. Here we attempt to answer three questions:

- 1) What is the recreational fishery worth as calculated by economists?
- 2) Has this economic value peaked, or is there room for expansion?
- 3) What other conservation investments have been made that promote recreational fishing economic benefits?

## Estimating Economic Values and Benefits

We reviewed literature on the economic values and benefits of salmon angling. Our analysis focused on Canada—in particular, the Canadian provinces of Quebec and New Brunswick. In these areas, salmon populations are well monitored, large recreational angling fisheries occur, and more economic information is available. The recreational fishery for Atlantic salmon *Salmo salar* is pursued in fresh water and river estuaries; we are unaware of any sport fishing for the species at sea. Salmon angling is limited to fly fishing, and voluntary live-release angling is growing in popularity. In some

jurisdictions, for conservation reasons, anglers are required to release alive any salmon larger than 63 cm fork length.

New Brunswick has kept a significant part of its salmon fishing resources in the private or quasi-private sector. Briefly, in an 1882 court judgment (*The Queen vs. Robertson 1882*, confirmed by the UK's Privy Council in 1898), authority over freshwater fishing rights was accorded to the Canadian provinces. Following this decision, each province then had the option of converting the resources into public property or treating them as private property and letting individuals or organizations own, buy, sell, or lease the exclusive right to fish in freshwater, either together with or separate from the ownership of the underlying land. The economic importance of resource ownership decisions by provinces is that public property resources are often disassociated from market demands. Prices are set depending on government objectives and policy (e.g., provide cheap public recreational opportunities). By contrast, private resources are subject to market pressures and will better reflect the true economic value (Tuomi 1980, 1987). Private resources therefore provide a much better indicator of the value accorded by the public to the Atlantic salmon sport fishery when the fishery has to be compared with competing water uses.

Recreational Atlantic salmon fisheries, as public resources, are also more difficult to study because of a lack of economic information. In Maine, the only remaining state with self-sustaining populations of wild Atlantic salmon (a public resource in the United States), stocks are severely depressed and all recreational angling fisheries for these salmon are closed (see Kocik and Brown, Chapter 1; Rideout and Ritter, Chapter 5). In the absence of a recreational fishery, few, if any, economic benefits are being realized. Instead, huge costs are being borne by taxpayers to provide restoration programs. A casualty of the fishing closure is a loss of volunteers who, in the past, would have worked to help conserve wild Atlantic salmon. Interest in the species is dwindling, and membership in local salmon associations is declining.

To address the question of the value of the recreational angling fishery in Canada, we present information about the capital value of salmon fishing properties (camps) in New Brunswick and on the money that anglers spend to go fishing. To determine whether the value of salmon fishing has peaked, we reviewed studies that examined the potential for making more money from salmon fishing. Some of these studies were regional in nature; others were plans for specific rivers. To document what we are doing to conserve the economic benefits of the recreational salmon fishing industry, we describe federal, provincial, and private-sector investments in promoting Atlantic salmon recreational fishing. Some of these are annual investments; others are one-time programs.

Studies of the economics of Atlantic salmon resources have been done in different places at different times. Unless otherwise noted, all values in this chapter are reported in Canadian dollars. Where considerable time has elapsed since a study was done, we have adjusted reported dollar values for rates of inflation. Inflation rates were calculated as

$$\text{Inflation (\%)} = (\text{CPI}_{i+1} - \text{CPI}_i) / \text{CPI}_i \times 100,$$

where CPI is the Bank of Canada Global Consumer Price Index for year  $i$ . Rates are posted on Statistics Canada's web site ([www.statcan.ca/english/Pgdb/Economy/Economic/econ46.htm](http://www.statcan.ca/english/Pgdb/Economy/Economic/econ46.htm)).

## Results

### What is the Recreational Angling Industry Worth?

In New Brunswick, Tuomi (1980) attacked the problem of determining the value of New Brunswick's recreational salmon fishery by aggregating the capital value of salmon angling waters as established by the market, rather than the annual revenues and expenditures from salmon fishing (i.e., the calculation of consumer and producer surpluses). Tuomi took this approach because information was available on the capital value of angling waters (lease and sale prices); information on revenues and expenditures was much poorer. A second reason was to focus on the fact that the value of the fishery is really future-oriented. That is, this information reflects what people are willing to pay in the expectation of future fishing; therefore, property value trends become more reliable predictors of future economic activities.

Using this approach, Tuomi (1980) assessed the market value for private water in 1978 as \$74.8 million. Correcting for annual rates of inflation (Bank of Canada review of Annual Consumer Price Index), the 2000 capital value of the fishery would be about \$194.4 million.

Additional economic value accrues to New Brunswick from the annual spending by anglers to go fishing. At present, there is no direct estimate available of what this value is for Atlantic salmon anglers. A crude value can be estimated using information from the latest Survey of Recreational Fishing in Canada (Economic and Policy Analysis Directorate 1997). This survey is updated at five-year intervals. In Canada, resident and nonresident anglers in 1995 spent on average \$523 and \$666 per angler per year, respectively. Multiplying these values by the number of resident and nonresident salmon licenses sold in New Brunswick in 1995 (21,949 and 6,030, respectively) gives values of about \$11 million and \$4 million, respectively, for a total of \$15 million per year. This is probably a minimum figure because costs of salmon fishing are above average and because it does not

include monies spent on capital items such as boats and motors that are purchased for angling purposes. Direct expenditures by anglers on all fish species in New Brunswick in 1995 were estimated at about \$27 million (Economic and Policy Analysis Directorate 1997).

In Quebec, Hydro-Québec commissioned a study of the value of the Atlantic salmon sport fishery for the province of Quebec (Michaud 1990). Here, information was available on the number of anglers and their annual spending on Atlantic salmon. Michaud (1990) based his analysis on a “travel cost” approach, in which the amounts individuals must spend to equip themselves for and undertake an annual salmon fishing trip are tallied. His goal was to model the dollar values that average anglers annually assigned to the practice of salmon fishing and sum these to arrive at a global estimate for the province. For 1988, this value was calculated as \$97 million. Correcting for inflation up to 2000 gives a value of \$131 million.

The present and future economic potential of these recreational fisheries seems to be eroding as salmon populations have declined. The numbers of salmon angling licenses in both New Brunswick and Quebec have been trending downward (Figure 2), although far more slowly than the salmon populations have declined (Figure 1).

**Annual sales of salmon fishing licenses (resident and non-resident combined) in New Brunswick and Quebec**

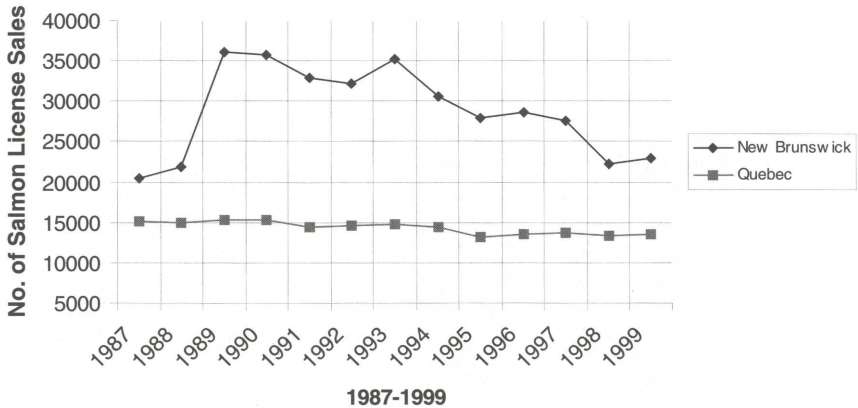


Figure 2. Annual sales of salmon fishing licenses (resident and nonresident combined) in New Brunswick and Quebec. Data provided by New Brunswick’s Department of Natural Resources and Energy and Quebec’s Ministère de l’Environnement et de la Faune.

## Can Economic Benefits from the Recreational Fishery be Expanded?

Many of the sources we consulted believe there is potential to expand recreational fisheries and generate more money from them. A number of targeted investments by public and private-sector partners have been undertaken in recent years, with the specific goal of expanding recreational fishing in general and salmon fishing in particular. Geographic scales of the efforts varied, ranging from those at the regional level to local endeavors in specific river systems.

### Regional approaches

*Quebec's salmon plan.* The economic plan for the development of salmon (Programme de développement économique du saumon, or PDES) was an offshoot of a larger agreement between the Quebec provincial government and the Canadian federal government to foster the economic development of the more isolated regions of Quebec (École nationale d'administration publique 1997a, 1997b). Of significance here is the fact that the Atlantic salmon fishery was identified as an economic engine with significant regional growth potential.

Over a five-year period (1991–1996/1997), the PDES made matching funding available for projects that would improve or restore habitat and runs in salmon rivers, develop infrastructure (making rivers more accessible to anglers), and improve sustainable management of the species. Worthy projects would receive grants of up to 85% of their total costs. At the project's end, about \$31.4 million had been spent or committed, of which \$3.3 million (10%) was a match from beneficiary organizations.

The bulk of the government funding for the program came from government agencies concerned with economic development rather than with environment or fisheries. Canada's Regional Development Office for Quebec contributed \$12 million (48%), and the province's Regional Development Office (Secrétariat au développement des régions) contributed an additional \$3.5 million (11%). A smaller fraction of the money was provided by more fishery-oriented sources: Quebec's Environment and Wildlife Ministry (Ministère de l'Environnement et de la Faune, or MEF; \$7.6 million, 24%) and the Quebec Wildlife Federation (Fondation de la faune; \$2.1 million, 7%).

The PDES had specific, well-defined objectives (École nationale de l'administration publique 1997a, 1997b). Its projects aimed to increase annual capture rates of salmon in the province from 16,000 captures (five-year average of captures in the 1983–1988 period) to a new high of 24,000, and to increase the annual number of person-days of fishing by 80,000. This was

expected to translate into additional annual revenues of \$12 million and create 200 to 250 new jobs in the fishery (e.g., guides, camp workers, etc.).

To date, the anticipated successes have not been fully realized. Recent North Atlantic-wide downturns in salmon populations have affected the rivers targeted under the PDES (e.g., Michaud 1990; Tremblay et al. 2000). The anticipated increase in salmon numbers following PDES efforts that could have generated additional fish captures did not materialize. However, the number of angler days has remained at the pre-PDES level, and about 40% of the targeted new jobs have been created (École nationale de l'administration publique 1997a). The partners in the program believed that it would take about two salmon generations for the full benefits of the PDES to be realized. Thus a full accounting for the benefits of the program will not be available until about 15 years after all the work is finished.

*The Atlantic Sportfishery Enhancement Program.* In 1992, the five-year Atlantic Sportfishery Enhancement Program for the Canadian Atlantic Provinces (Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick) was initiated. The Atlantic Canada Opportunities Agency, an economic development arm of the Canadian federal government, contributed \$57.3 million towards this initiative. The four Atlantic provincial governments provided an additional \$21.6 million. The money was used to fund recreational fisheries cooperation agreements (Gardner Pinfold Consulting Economists Limited 1996).

The Atlantic salmon was one of the species targeted by this program. We were unable to determine how much money was spent specifically on Atlantic salmon in New Brunswick, Nova Scotia, and Prince Edward Island. However, figures are available for Newfoundland, where the sport fishery is generally limited to salmonids, primarily the Atlantic salmon and the brook trout *Salvelinus fontinalis*.

In Newfoundland, the federal and provincial governments developed a five-year (1992-1996) Cooperative Agreement on Salmonid Enhancement/Conservation (CASEC). In this period, \$18.4 million was spent in the province to foster the health and economic benefits drawn from salmonid fisheries. The money was used for assessments of populations, enhancement, habitat enhancement, enforcement, and strategic planning and industry development. Atlantic salmon projects received the lion's share of the money (80% of assessment expenditures, 87.5% of enhancement, 84% of habitat, about 90% of enforcement, and 90% of economic development monies, respectively; D. Ivany, Atlantic Salmon Federation Regional Director for Newfoundland, personal communication).

### Individual river approaches

*Newfoundland's Humber River.* Gardner Pinfold Consulting Economists Limited (1997) examined the present economic value of the sport fishery for Atlantic salmon on the Humber River and studied various scenarios to draw additional value from it. The scenarios involved enhancing the value of the fishery's potential economic benefits by extending the annual fishing season later into the autumn, controlling access to the fishery (limit the daily numbers of anglers and duration of angling), increasing stock size, offering trophy fish (killing of large fish is currently forbidden), and creating river-specific angling licenses.

The Humber River is the second largest salmon river in Newfoundland. Its watershed encompasses about 7,679 km<sup>2</sup>, and its salmon run includes both grilse or one-sea-winter (1SW) fish and large multi-sea-winter (MSW) fish. The Gardner Pinfold (1997) report points out, "The Humber River is classified as a Zone 1 system by the North Atlantic Salmon Conservation Organization (NASCO) protocols. Rivers in this category are defined as 'pristine rivers, with no significant, man-made habitat alterations, no history of transfers of fish into the watershed, and no fish rearing operations in the watershed.'" The Humber's NASCO designation is curious, given that the main branch of the Humber River watershed (about 78%) was developed for hydroelectric generation by Deer Lake Power in 1924, eliminating it as productive fish habitat (Humber River Allies fact sheet, 15 May 1997).

The consultants estimated that in 1996, anglers spent about \$1.5 million dollars to fish this river, with \$0.7 million coming from Newfoundland residents and \$0.8 million from nonresidents, creating about 78 jobs.

Gardner Pinfold staff queried anglers to ask them what things could be done to get them to fish more (and spend more) on the Humber River. With this information, they evaluated a series of scenarios involving combinations of the actions described above to see if economic benefits could be increased.

In their best scenario, they estimated that nonresident expenditures could be improved by \$2.7 million to \$3 million per year (a maximum of +375%) and an additional 96–113 (maximum of +144%) jobs created. The keys to success lay in increasing the size of the river's salmon population, so that more people could and would want to fish, and in prolonging the annual season. Potentially, this could also permit anglers to take home large (trophy) fish. By contrast, scenarios using a river-specific licensing system or adding access limitations were estimated to reduce total angler expenditures on the river by about \$20,000 per year. Finally, an aggressive marketing campaign would be required to let potential nonresident clients know of the fishing opportunity.

The consultants actually felt that their approach was conservative. By



“packaging” salmon fishing with other activities (e.g., hiking in national parks, etc.), they felt that much more money could be made.

*Nova Scotia's Margaree River.* GTA Consultants (1993) evaluated the economic benefits of Atlantic salmon angling in the Margaree River, Nova Scotia. The Margaree's salmon run principally arrives over a short period during the autumn. GTA (1993) estimated that, in 1992, 2,100 license holders (both resident and nonresident) fished the Margaree River and spent about \$986,258 to do so (95% confidence limits \$700,000–\$1,300,000). This created 55 jobs.

The consultants cautiously suggested that enhancing present stocks of the river could increase revenues by about \$250,000 per year. Their caution stemmed from the fact that these benefits would be difficult to realize, because the short time period in which the run enters the river occurs when many of the fishing spots are already full. However, GTA felt that an enhancement that altered run timing, so that more fish arrived in the summer could also increase spending by about \$250,000. The biological consequences of tinkering with the genetics of the fish were not discussed.

## How do Conservation Investments Aid Recreational Fisheries?

### Buyouts of commercial licenses

Commercial interceptory fisheries in the oceans off Greenland and along the coasts of Canada had enormous impacts on North American Atlantic salmon populations through the 1960s and 1970s. Recognizing this and the fact that—on a per fish basis—much more value was realized from an angled fish than a gill-netted fish, the Canadian government began to buy out existing commercial licenses in the 1970s (Tuomi 1987). At a cost of more than \$40 million, more than 5,200 commercial salmon licenses were retired throughout Atlantic Canada between 1972 and 1996 (Pat Chamut, assistant deputy minister, Department of Fisheries and Oceans, speech to a November 1996 Atlantic Salmon Federation conference).

The private North Atlantic Salmon Fund, based in Iceland, also intervened to buy out the Greenland fishery. In 1993 and 1994, this organization purchased the 201-metric ton annual commercial quota (about 122,000 maturing salmon) allocated to Greenland by the North Atlantic Salmon Conservation Organization at an annual cost of US\$400,000 (contract between Kalallit Nunaanni Aalisartut Piniartullu Kattuffiat [the Association of Hunters and Fishermen of Greenland] and the North Atlantic Salmon Fund). The agreement permitted a subsistence fishery of 12 metric tons in each of these years. Money for the purchase came from private sources, corporations, and various governmental agencies. The contract called for a

three-year renewal, starting in the 1995 season. For various reasons, however, this was never achieved.

A voluntary two-year program to permanently buy out the limited commercial salmon fishery (84 licenses; 1,285 salmon caught in 1999) that was still being pursued in the Lower North Shore region of Quebec (Gulf of St. Lawrence) was initiated in 1997. The \$1.4 million cost of the buyout was split between the Canadian federal government and the province of Quebec. Commercial salmon catches declined about 39% between 1998 and 1999 as a result of this effort, and the 1999 catches were 88% lower than the average of the 1994–1998 period (Tremblay et al. 2000).

### Education Efforts

Investments have been made in education programs that help conserve fish populations and promote recreational fisheries. In Atlantic Canada, a \$5.7 million, five-year (1992–1996) education and public awareness program (EPAP) was undertaken by the Atlantic Salmon Federation to heighten public awareness of recreational fishery resources and public involvement in the fishery itself (Gardner Pinfold Consulting Economists Limited 1996; Anderson and Dominy 2000). This program had four components: public awareness, education, public involvement, and native involvement. Measuring the effectiveness of such programs is difficult. An independent evaluation of EPAP's success concluded that the program positively influenced people's attitudes and, to some extent, their behavior toward recreational fisheries (Gardner Pinfold Consulting Economists Limited 1996; Anderson and Dominy 2000). It was not possible, however, to determine if this translated into an increase in expenditures by the public on recreational fishing.

More sustained educational efforts come from salmon interpretation centers that have been established in New Brunswick (the Miramichi Salmon Museum in Doaktown and the Wilfred M. Carter Atlantic Salmon Interpretive Centre in St. Andrews) and Quebec (the Centre d'interprétation du saumon atlantique in Ste. Flavie). Built as tourist attractions, these three centers collectively generate annual revenues of at least \$150,000 per year, provide seasonal employment, and are an important tool for promoting the conservation of the species and the sport fishery. Other similar centers exist or are under development in other regions.

## Discussion

We have estimated current direct expenditures on Atlantic salmon fishing in Quebec and New Brunswick to be about \$146 million per year. Recreational salmon fishing is also pursued in Newfoundland and Labrador, Nova Scotia,

and Prince Edward Island. We do not have figures for salmon angling for these areas, but in 1995, anglers in Newfoundland and Labrador, Nova Scotia, and Prince Edward Island spent \$48 million, \$17.6 million, and \$1.8 million, respectively, to go fishing for all species (Economic and Policy Analysis Directorate 1997). If only 30% of this was for salmon fishing, the Maritimes and Quebec Atlantic salmon fishery would inject \$166 million into the Canadian economy. New Brunswick's capital value for salmon waters could now be worth \$194 million.

There is great interest in increasing the economic value obtained from all recreational fisheries, including salmon. A flurry of strategic plans have been developed, including those for New Brunswick (Loftus et al. 1993; Economic Planning Group of Canada 1993), Prince Edward Island (Ace Consultants, Inc., and Island International Consultants, Inc. 1992), Newfoundland and Labrador (Buchanan et al. 1994), Quebec (Michaud 1992), Nova Scotia (Canadian Fishery Consultants Limited 1994), and for the Maritimes in general (Hickling Corporation 1994). The common thread of these plans is that the sport fishery has significant regional economic benefits and that, with enhancements to present populations and targeted marketing, a lot more money could be generated.

The studies for Atlantic salmon reviewed in this chapter suggest that there is significant potential to generate more money from salmon angling in North America. The key lies in improving salmon returns to rivers to levels well above those occurring today (Figure 1). Quebec's regional economic development plan for salmon has not yet achieved its goals, at least in part because of poor returns to the rivers.

It is fair to ask what ecological impacts have resulted from the various economic initiatives. The buyouts of commercial sea nets have stopped mixed-population fisheries that may have resulted in salmon overharvesting, especially of populations in smaller rivers. The closure of the commercial fisheries in North America may have slowed but failed to reverse the declines in returns to river. The buyouts have not, therefore, achieved their hoped-for effect. However, education and public awareness programs (Anderson and Dominy 2000) have successfully promoted catch-and-release fishing for salmon. Research (Tufts et al. 2000; Whoriskey et al. 2000) has shown that released fish survive and go on to spawn. Catch-and-release fishing provides many economic benefits with minimal biological impacts upon salmon populations. Despite the implementation of catch-and-release fishing and the other economic initiatives, however, salmon runs to North American rivers have continued to decline.

Although it is far from clear what has caused the downturn in salmon returns, poor survival of salmon at sea seems to be a major determinant (Department of Fisheries and Oceans 1998; ICES 2000). In addition, threats to freshwater salmon production capacity continue. These seem to have

started when Samuel de Champlain installed the first dam on a salmon stream, a tributary of the Annapolis River, Nova Scotia, around 1606 (Morison 1972). At present, we are aware of registered proposals for hydrodevelopment in at least seven Atlantic salmon watersheds: the Moisie, St. Jean, and Romaine rivers in Quebec; and the Northwest, Southwest, and Humber rivers and Garia Bay in Newfoundland. Pollution, habitat destruction, and poor forestry and agriculture practices are contributors to the decline in salmon returns (Watt 1988, 1989). These activities also have significant economic potential, and conflicts on rivers are increasingly focusing on which activities bring the greatest economic and social gains with the least environmental damage.

A number of social, nonmonetary, and/or indirect benefits also flow to humans from wild salmon populations. For example, in *Ronald Edward Sparrow vs. Her Majesty the Queen* (1990), Canada's Supreme Court upheld an aboriginal right to fish under the Canadian Constitution Act of 1982. In this decision, the court ruled that allocations to the fisheries were to be made according to the following priorities: 1) conservation of the fishery, 2) aboriginal fisheries for food, social, and ceremonial purposes, and 3) other fisheries. Thus, fishing was recognized as having an enormous social value in native cultures, including those that fish Atlantic salmon in Atlantic Canada. But what is the dollar value of a constitutional right?

Aesthetic values are also difficult to quantify. For many anglers, the actual catching of salmon is a small portion of the fishing experience. Enormous pleasure and value can be drawn from being out of cities on wild rivers. This value exists and, to a degree, compensates for poor angling capture rates. If it did not, given present capture rates of as low as 0.5–0.1 Atlantic salmon/angler/day (e.g., Tremblay et al. 1998), the sales of salmon licenses would be far poorer than they actually are (Figure 2). However, present and future economic benefits from salmon angling are eroding, and they will continue to erode if the downward trends in license sales continue.

A third example of hard-to-quantify benefits that flow from wild salmon populations is in the salmon farming industry. Canadian east coast Atlantic salmon farming is variously estimated as having annual revenues of \$115 million to \$140 million. The industry started with broodstock from wild fish. The many river-specific populations of Atlantic salmon are potential sources of problem-solving genetic characteristics (e.g., disease resistance) that could improve aquaculture production in the future. It is difficult to estimate what these economic benefits might be.

In summary, the Atlantic salmon is important as a current and potential economic engine in the North Atlantic region, and it has other significant social or nonmonetary values. Despite the concurrence of economic, ecological, and social values of salmon, populations of the species remain

depressed and, in some places, in danger of biological extinction. By examining the economic (and noneconomic) values and benefits of this fishery, however, we can better understand the importance of conserving this species, and we can develop more comprehensive and effective conservation approaches.

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