Fisheries and Oceans Canada
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AQUACULTURE in Canada

SOCIO-ECONOMIC IMPACT OF AQUACULTURE IN CANADA

Canada

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SUMMARY

Overview

This study provides estimates of the economic impact of aquaculture in Canada, with a focus on impacts at the community or regional level in the major producing areas. It also examines the challenges the industry faces in achieving its production potential.

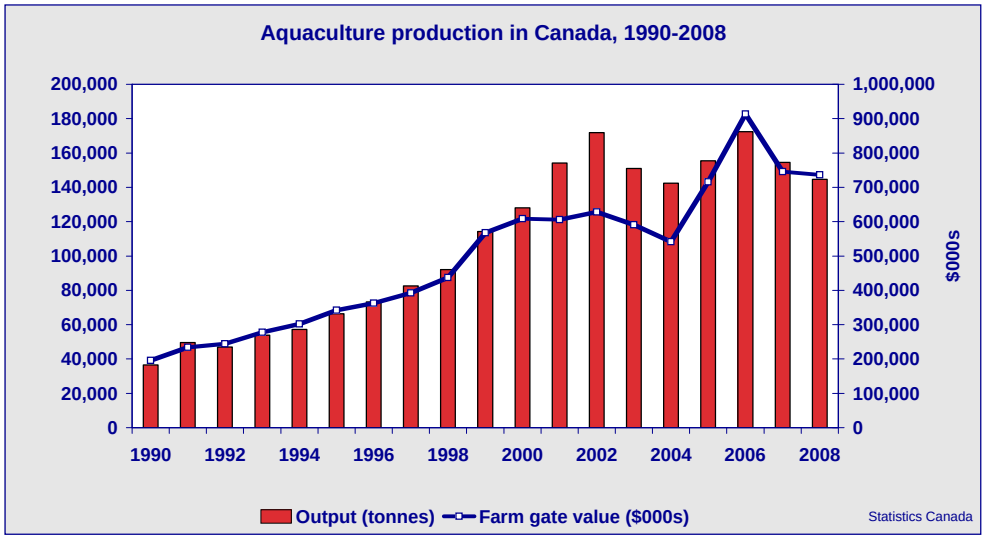
Commercial aquaculture in Canada traces its history to the 1950s, with trout farming in Ontario, British Columbia and Québec, and oyster culture in New Brunswick, British Columbia and Prince Edward Island. The industry took off with the successful development of salmon farming. The first attempts to culture salmon commercially in Canada began in the early 1970s in British Columbia, with development work in the mid-1970s in New Brunswick and Nova Scotia. A mussel industry emerged on the east coast during the 1970s, expanded rapidly in Prince Edward Island during the 1990s, and today is the nation's leading shellfish species by weight and value.

Today, aquaculture takes place in all ten provinces and the Yukon Territory. Production of Atlantic salmon, Chinook Salmon, trout, Arctic char, blue mussel, oyster and clam are well established. Several other species including halibut, sturgeon, tilapia, sablefish and scallop are at various stages of development.

Production

Aquaculture production in Canada increased more than four-fold between 1990 and 2006. Output (in round weight equivalent tonnes) increased from 40,000 to 170,000 t, while farm gate value increased from $195 to just over $900 million (Figure S-1). The decline in output value to the $740 million range in 2008 was due to price weakness and a cut in production on the east coast due to changes in the management system.

Figure S-1



The quantity and value of national output is divided about equally between the Pacific and Atlantic coasts, though British Columbia leads all other provinces, typically accounting for about 50% of total production value vs. 25-30% for New Brunswick. Figure S-2 provides a breakdown of output value by province, while Figure S-3 gives a breakdown of quantity produced (tonnes) by species.

Figure S-2

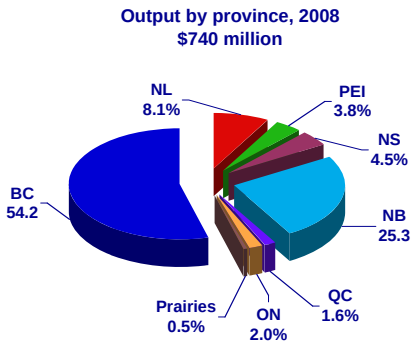
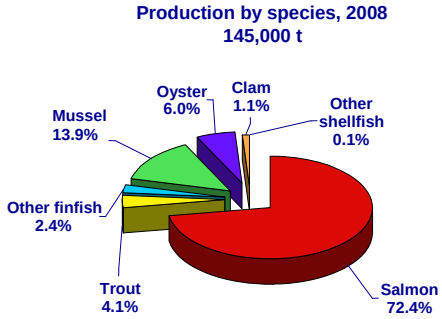


Figure S-3



The value of output produced by the Canadian aquaculture industry in 2007 is estimated at just over $1.0 billion (Table S-1). This is the aggregate value of final products sold into the wholesale market by Canada's aquaculture companies. Final product value is built up from farm gate value and any value added gained through basic processing (e.g., dressing and filleting in the case of salmon or trout, and washing and grading in the case of mussels and oysters). Many finfish producers are fully integrated, conducting both grow-out and processing activities. Several shellfish growers process their own output and also process on behalf of other growers.

Economic impact

Economic impact is measured using three key indicators: GDP, employment and labour income. Impacts are measured at three levels of activity: direct, indirect and induced, where *direct* captures the impact of the aquaculture industry itself (hatcheries, grow-out operations and processing); *indirect* captures impacts in the industries supplying goods and service to aquaculture, and *induced* captures the impacts arising from spending of income earned by those employed in direct and indirect activities.

Table S-1
Aquaculture final product value ($000s)

	Finfish	Shellfish	Total
British Columbia	522,600	37,100	559,700
Ontario	17,000	-	17,000
Québec	12,700	1,000	13,700
New Brunswick	272,900	7,000	279,900
Nova Scotia	43,000	10,000	53,000
Prince Edward Island	1,900	56,000	57,900
Newfoundland and Labrador	38,800	5,600	44,400
Total	908,900	116,700	1,025,600

Economic impact arises as industry expenditures work their way through the economy. An aquaculture company's spending on inputs becomes the revenue many another companies, which they in turn they spend on inputs for the goods and services they produce, and so on. The sum of these rounds of spending reflects the gross value of economic activity. This activity occurs in the province where aquaculture takes place, and also the other provinces where supply and service industries are located. The gross value of output generated by aquaculture in Canada in 2007 was $2.1 billion.

Data on gross value of output illustrate how important aquaculture in one province is to that province and to all other provinces in Canada. Reading the date in Table S-2 horizontally gives the economic activity triggered across Canada by aquaculture production in each province. Reading vertically gives the total activity in each province triggered by its own industry and the industries in the other provinces.

- **Aquaculture has extensive linkages across Canada**. Though most of the activity triggered by aquaculture occurs in the province of production (illustrated by the diagonal line of boxes in Table S-2), supply and service industries in each province benefit at least in a minor way from aquaculture activity in every other province.
- **Aquaculture has strong intra-provincial linkages.** Across all provinces, the dollar value of the level of economic activity triggered by aquaculture in each province is about double the value of aquaculture output in that province. For example, aquaculture output was $279.9 million in New Brunswick in 2007 and triggered total economic activity valued at $588.3 million across Canada.

Table S-2
Gross value of output by province ($000s)

	Aquaculture output value ($000s)	BC	NB	NS	NL	PE	ON	QC	Other	Total
BC	559,700	946,129	1,650	1,710	864	182	69,915	67,343	134,006	1,221,799
NB	279,900	11,388	400,038	47,429	7,058	5,745	51,367	45,817	19,414	588,256
NS	53,000	688	6,485	79,587	855	496	10,120	4,085	2,902	105,218
NL	44,400	444	2,329	5,418	65,791	288	7,448	2,539	3,442	87,699
PE	57,900	374	4,229	1,931	427	70,633	3,281	1,394	839	83,108
ON	17,000	1,073	76	183	81	26	26,372	1,583	1,269	30,662
QC	13,700	337	204	163	144	27	1,137	19,623	892	22,526
	Total	960,432	415,012	136,420	75,220	77,399	169,639	142,384	162,764	2,139,270

Source: Statistics Canada Interprovincial Input-Output Model (2005 version)

In total, the aquaculture industry generated just over $1.0 billion in GDP in Canada in 2007, with just over $320 million in direct GDP and about $685 million in spin-off impact. It created an estimated 14,500 full-time equivalent jobs, though the overall employment impact was higher because of the seasonality of some activities. Overall labour income is estimated at just over $500 million. Impacts are set out at the national level and for the provinces in Table S-3. Provincial

impacts capture only impacts of activities occurring within the boundaries of the province. The national indirect and induced impacts include impacts spilling over to other provinces.

Table S-3
Aquaculture Impact in Canada

Value of output $1,025.6 million	Newfoundland and Labrador	Nova Scotia	Prince Edward Island	New Brunswick	Québec	Ontario	British Columbia	Canada
GDP ($000s)								
Direct	20,000	22,800	42,800	69,100	8,200	7,480	151,100	321,480
Indirect	8,400	10,600	6,400	47,200	2,500	4,080	167,900	450,400
Induced	6,200	8,500	10,400	30,800	3,700	4,250	106,300	233,300
Total	34,600	41,900	59,600	147,100	14,400	15,810	425,300	1,005,180
Employment (FTE)								
Direct	215	380	790	1,100	80	110	2,220	4,895
Indirect	120	170	125	790	35	55	2,330	6,400
Induced	70	120	250	530	45	51	1,410	3,200
Total	405	670	1,165	2,420	160	216	5,960	14,495
Income ($000s)								
Direct	6,200	12,200	22,000	32,700	2,600	2,720	78,400	156,820
Indirect	4,900	6,400	2,900	28,300	1,200	2,040	95,100	241,200
Induced	2,200	4,800	6,400	16,800	1,230	1,530	50,400	107,900
Total	13,300	23,400	31,300	77,800	5,030	6,290	223,900	505,920

Note: Provincial impacts capture only impacts of activities occurring within the boundaries of the province. The national indirect and induced impacts include impacts spilling over to other provinces.

Community impact

Campbell River and Comox (Comox-Strathcona Region), British Columbia

With the decline in forestry and the commercial fisheries, salmon and shellfish aquaculture occupy an increasingly important place in the economy of northern Vancouver Island.

- The major salmon companies are headquartered in Campbell River, as are many of the companies supplying goods and services including fish processing, nets and maintenance, transportation, packaging, containers, diving services, and machinery and equipment.
- Well over 200 firms in Northern Vancouver Island supply goods and services to the industry. Many of these are wholly dependent on the salmon aquaculture industry.
- Of the total expenditures of $382 million made by the industry in 2007, about $290 million was spent in the impact area
- Many of those employed on farm sites up and down the coast are based in Campbell River and its surrounding communities.
- Shellfish aquaculture is centred south of Comox in Baynes Sound and in the Cortes Island/Okeover Inlet area.
- Salmon and shellfish aquaculture account for about 10% of employment and income in the impact area (the Comox-Strathcona region).

Charlotte County, New Brunswick

Aquaculture has transformed Charlotte County from a high unemployment-low income area to one of relative prosperity within the province.

- All the production companies are headquartered in St. George, as are many of the companies supplying goods and services including processing, nets and maintenance, transportation, packaging, and machinery and equipment.
- Some 100 firms supply goods and services to the industry. Many of these are wholly dependent on salmon aquaculture.
- Of the total expenditures of $205 million made by the industry in 2007, about $150 million was spent in the impact area on direct and indirect inputs.
- Salmon aquaculture accounts for about 16% of employment in the County, and 26% of employment income.

Northern / Eastern Prince Edward Island

Aquaculture makes several key contributions to the impact area economy.

- Provides a year-round source of income and employment in an area that has traditionally experienced few alternatives to seasonal fishing and agriculture
- Is a widely-distributed activity (geographically) and accessible to those who prefer a rural lifestyle
- Creates (rather than circulates) wealth in the sense that aquaculture relies almost exclusively on export markets for its revenues
- Of the total expenditures of $27.0 million made by the industry in 2007, about $24.0 million was spent in the impact area on direct and indirect inputs
- Aquaculture accounts for about 10% of the employment and income in the Impact Area.

Manitoulin Island, Ontario

Trout aquaculture represents an important source of economic diversification for Manitoulin Island. The Island's relatively high unemployment rate reflects the challenges rural communities face in generating sources of economic opportunity. Making productive use of local resources to earn income by "exporting" products contributes to the foundation of the local economy. Of the total expenditures of $8.7 million made by the industry in 2007, about $5.1 million was spent in the impact area. Aquaculture accounts for about 1% of employment and income in the area.

Opportunities and challenges

British Columbia

According to industry there is limited growth opportunity in salmon production in British Columbia, at best, the increase may amount to about 10% over current levels (70-75,000 t/year). Site productivity is considered a limiting factor; though the Ministry of Agriculture and Lands licences some 130 sites, some 30-40 of these are inactive because of low productivity. Achieving 10% growth hinges on access or amendment to increase production on existing sites to more exposed sites with higher productivity.

Several factors impede the industry's ability to grow and strengthen its market position. Among these is a regulatory process that is slow to approve new sites or amendments to existing leases.

This leaves the industry with too many small, unproductive and high cost sites. Poor social licence arising from the public's belief that salmon farming is responsible for damage to wild stocks undoubtedly contributes to the slow pace of regulatory approvals. Provincial duty to consult and accommodate First Nations' rights and title interests must also be factored into decision-making timelines.

Studies indicate that the shellfish farming industry has considerable opportunity for growth, considering market potential, estimates of capable marine lands, and through productivity increases. But the industry has grown slowly over the past decade, and faces several challenges in meeting its potential. Because the industry is composed of small production units it lacks the financial resources to support technological innovation, resulting in low productivity, low margins and difficulty attracting and retaining a labour force. There is also a need to address public concerns about expansion based on environmental and aesthetic concerns. Public education, innovation, First Nations consultation (as with finfish), lack of hatchery and potential limits to seed access are key to resolving these issues.

Atlantic Provinces

There is opportunity for growth in salmon production in the Atlantic Provinces. The bay management system introduced in New Brunswick in 2006 reduced the number of active sites in any year. Annual production capacity under favourable conditions is estimated at 45,000 t based on 11 million smolt stocked. The industry is currently stocking 7-8 million smolt, with production in the 35,000 t range. There is scope to expand in Nova Scotia, though biophysical conditions (risk of superchill) and public opposition limit the potential sites. Opportunity for expansion also exists in the Bay d'Espoir area in Newfoundland and Labrador, though no firm estimates of production potential are available.

The industry currently finds itself well placed to take advantage of growth opportunities. It is close to the U.S. and Canadian markets, and currently enjoying rising prices in both areas. The industry is also structured for growth, having consolidated into four main companies from about 40 in the mid-1990s. It also enjoys good social licence in most areas, contributing to a positive investment climate.

Based on estimates of biophysical capacity, the shellfish farming industry has opportunity for growth in Nova Scotia, New Brunswick and Newfoundland and Labrador, but limited growth potential in PEI. And though the industry enjoys a good position in the Canadian and U.S. markets, the market has not developed in step with the production capacity of the industry. As a consequence, the industry has struggled with low prices and small margins.

The industry throughout the region is composed of many small family-owned farm operations, with a few larger companies combining both farming and processing. This represents a good rural development model, but it also contributes to the overall weakness of the industry. Because the industry is composed of small production units it is characterized by low productivity, limited technological innovation, strong competition for market share, and ultimately low margins. The opportunities for improved performance would appear to rest on market development and the industry taking a more coordinated approach to marketing.

Ontario

The industry is based on access to sites offering excellent biophysical conditions, and proximity to a large market in southern Ontario. It also is supported by many businesses providing essential goods and services.

Though there is ample scope for expansion based on suitable space with good growing conditions, the regulatory regime is not seen as supportive by industry, and there is also opposition by adjacent landowners and cottage-owners. Some of this opposition is based on aesthetic considerations, and some on apprehensions about environmental damage. The fear in the industry is that unless there is expansion, interest by the existing growers who have struggled to develop the industry could wane, making it difficult to sustain the enterprises through to a second generation, and making it impossible to attract new growers.

1

INTRODUCTION

1. Study rationale

Aquaculture in Canada generates $800-900 million in farm gate revenues.[1] It creates thousands of direct jobs, and many more in industries with which it has strong backward and forward linkages. Aquaculture production occurs to a greater or lesser degree across Canada, with activity concentrated in British Columbia and the Atlantic Provinces.

The industry has experienced remarkable growth over the past 20 years, with overall production increasing more than four-fold. Interest in what are today the main farmed species – salmon, mussel, trout and oyster – began in the 1970s. The early years were marked by considerable research and development aimed at selecting the best strains and understanding the habitat conditions that produced optimal growth. The industry – particularly salmon and mussel – began to take off in the late-1980s.[2]

The growth occurred because of the availability of new sites, substantial investment in capacity, improved production techniques and the ability of the industry to compete in international markets where demand has also grown substantially.

What the production figures alone do not reveal is the substantial economic and socio-economic contribution the industry makes at the micro level – at the level of the coastal and rural communities where aquaculture actually takes place. In these communities, aquaculture generates thousands of jobs and millions of dollars in income. It does so through direct activity at the farm sites, and also in indirect ways through backward linkages to suppliers of equipment, feed and services, and forward linkages to processors and marketers. In many cases, these communities are in isolated areas where economic opportunity tends to be limited.

Several studies have the analyzed the economics and estimated the economic impact of aquaculture at a macro scale, generally at a provincial level[3]. Some studies have also examined the economics of aquaculture at a community level, and while helpful in increasing understanding, they often respond to a specific need and cover a single species, limiting their effectiveness. Taken together, these studies lack a uniform focus, scope and approach, making it difficult to combine the results into a coherent whole.

[1] Statistics Canada, Aquaculture Statistics 2008, Cat. No. 23-222-X

[2] An overview of the development and growth of salmon aquaculture in British Columbia may be found in Robson, Peter A., *Salmon Farming: The Whole Story*, 2006, Heritage House Publishing, Surrey, BC. For a description of the early development of aquaculture in Atlantic Canada, see *Cold-Water Aquaculture in Atlantic Canada*, 1995, edited by Andrew D. Boghen, Canadian Institute for Research on Regional Development.

[3] For example, Gardner Pinfold (2009). Economic Impact of Marine Related Activities in Canada. Fisheries and Oceans Canada

2. Scope and approach

The report is aimed at filling some of these gaps; to quantify the economic impact of aquaculture in each of the provinces with an aggregation to the national level, and to explore the significance of aquaculture activities in selected communities. This information is essential to guide the formulation of policy and strategies for sustainable aquaculture development. A secondary aim is to provide a baseline to compare industry growth and its future impacts. More specifically, the objectives are:

- **Economic:** to assess the economic impact of the aquaculture industry on the Canadian and provincial economies through an analysis of direct, indirect and induced economic benefits produced by each of the sub-sectors – finfish and shellfish. This analysis is intended to capture the structural (e.g., size/ownership/linkages) and regional diversity (e.g., species mix by province) of the industry.
- **Socio-economic:** to assess the socio-economic impact of the aquaculture industry on selected communities. This includes an analysis of the significance of the industry at the community level using a range of social indicators (e.g., demographic, employment and income level).
- **Future growth:** to identify opportunities and challenges facing the industry over the next several years.

Achieving these objectives requires data – data on the value of aquaculture output to estimate economic impact; and data on the nature, scale and location of aquaculture activities to describe and measure impacts at the community level. Data on the value of output are obtained from Statistics Canada sources, with some modifications to capture the full extent of aquaculture activity. These modifications are based on information obtained through extensive interviews with leading aquaculture companies on both the Pacific and Atlantic coasts. These interviews also form the basis for the assessment of community impacts (specifically to gain insight into industry structure and linkages), and to identify opportunities and challenges for the future.

3. Report contents

The report is divided into six chapters. Following this introduction,

- Chapter II provides an overview of the aquaculture industry in Canada, including species, methods, geographic distribution and production levels.
- Chapter III provides an overview of methodology and data, and sets out economic impact estimates at the national and provincial levels.
- Chapter IV contains the community impact assessment, examining the role aquaculture plays in generating employment and income as well as business development.
- Chapter V sets out growth projections for the industry, and examines some of the main challenges and opportunities facing aquaculture in Canada.
- Chapter VI outlines future research requirements.

2

AQUACULTURE IN CANADA

1. Species and production methods

Overview

Commercial aquaculture in Canada traces its history to the 1950s, with trout farming in Ontario, British Columbia and Québec and oyster culture in New Brunswick, British Columbia and Prince Edward Island. These early ventures tended to be small scale, using fairly rudimentary techniques and equipment. Production levels were modest.

The industry took off with the successful development of salmon farming. The first attempts to culture salmon commercially in Canada began in the early 1970s in British Columbia, with various Pacific species.[4] These early efforts were largely experimental and met with limited success. In the mid-1970s, development work was underway in New Brunswick and Nova Scotia with Atlantic salmon, following the success with this species in Norway.[5] By the mid-1980s, the industry had gained a solid footing in New Brunswick, and in 1984, Atlantic salmon were allowed to be imported and farmed in British Columbia.

The oyster industries in British Columbia, Prince Edward Island and New Brunswick had become well established by the late 1980s, and flourished during the 1990s and early 2000s. A mussel industry emerged on the east coast during the 1970s, expanded rapidly during the 1990s, and today is the nation's leading shellfish species by weight and value. The cage culture of trout continues in Ontario and other provinces, with production doubling from levels in the 1990s.

Finfish

Finfish aquaculture operations can be divided into three distinct components or phases: hatchery, grow-out and processing. The phases described below pertain to salmon; trout culture is similar, with grow-out occurring in a freshwater environment.[6]

- **Hatchery**: eggs collected from broodstock are fertilized and incubated in freshwater hatcheries, passing through four main developmental stages – egg, fry, parr and smolt – during an 18-month period. The hatchery simulates the early life stages that salmon spend in rivers. At the smolt stage, with a weight of 75-100 grams, they are ready for

[4] An excellent overview of the development and growth of salmon aquaculture in British Columbia may be found in Robson, Peter A., *Salmon Farming: The Whole Story*, 2006, Heritage House Publishing, Surrey, BC.
[5] For a description of the early development of salmon farming in Atlantic Canada, see Saunders, R.L. "Salmon Aquaculture: Present Status and Prospects for the Future", in *Cold-Water Aquaculture in Atlantic Canada*, 1995, edited by Andrew D. Boghen, Canadian Institute for Research on Regional Development.
[6] Other finfish are also beginning to be cultured, including cod, halibut and blackcod. These are saltwater species with a production cycle different from that described for salmon.

transfer to saltwater cages (either by tanker truck on a ferry, or by pumping them from the hold of a specially designed boat).

- **Grow-out**: smolt are placed in saltwater cages for grow-out to marketable size (4-5 kg), a period lasting 16 to 24 months. Cages, generally clustered in groups of 10-12 and anchored in nearshore waters, consist of rigid frames from which nets are suspended to contain the fish and to protect them from predators. Most growers place smolt in two stages, spring and fall, in order to maintain year-round production. Fish are fed throughout grow-out, with consumption closely monitored using cameras installed in the cages. Fish health is also closely monitored. Generally, 9-10% of the smolt placed will not survive to harvest, with mortality highest in the early months. Once fish reach marketable size, they are harvested by removing them from the cages, stunning them and placing them in the holds of harvest vessels for transport to shore and transfer to processing plants.
- **Processing**: most salmon are processed to the primary stage, consisting of gutting and cleaning the fish. These are marketed as whole fish (Dressed Head On or DHON). Most of the Atlantic salmon produced in British Columbia are processed in this form, while an increasing proportion of New Brunswick production is processed to the secondary stage (fillets, portions and steaks) in response to changing market conditions.

Shellfish

Shellfish aquaculture operations may be divided into three distinct activities: seed collecting and stocking, grow-out and processing. The activities described below pertain to oyster and mussel, the predominant commercial shellfish species in Canada.[7]

- **Seed collecting/stocking**: seed (oyster or mussel larvae) may be collected from natural sources (e.g., marine estuaries) using various types of collectors (simple rope in the case of mussels, or rope strung with "cultch" – shell or other material to which larvae can attach – in the case of oyster). Once seed has grown to adequate size, it is removed, graded and stocked in the grow-out medium. Most oyster seed in British Columbia is obtained from hatcheries, removing the uncertainty surrounding the timing and size of natural spawning events.
- **Grow-out**: off-bottom suspension techniques are generally used because of improved growth rates and reduced risk of predation. Mussels are stocked in mesh socks or sleeves and suspended in the water column from floating longlines (or from rafts in some areas). They grow to marketable size in 18-24 months. Oysters may be placed in trays or racks suspended from rafts or longlines or may be placed in vexar bags on the bottom or in bottom-founded racks until they reach marketable size (36-48 months). Harvesting is largely a manual affair, though is becoming increasingly mechanized as producers grow in size.
- **Processing**: most mussels and oysters are sold in-shell (live), so require minimal processing. They are cleaned, graded, packed and shipped.

2. Aquaculture across Canada

[7] For more detail on growing techniques, see PEI Department of Agriculture, Fisheries and Aquaculture, *Aqua Info – Mussel Culture in Prince Edward Island*; BC Shellfish Growers Association, *BC Seafood Factsheets - Pacific Oyster*.

Aquaculture occurs in all provinces and in the Yukon Territory. Several marine finfish and shellfish species are well established on the east and west coasts, with other species at various stages of development. Table 1 provides a summary of species produced across Canada.

Table 1
Aquaculture Species in Canada

	Finfish	Shellfish	Plant
Newfoundland and Labrador	Atlantic Salmon Steelhead Trout Cod	Mussels Clams	
Nova Scotia	Atlantic Salmon Arctic Char Halibut Steelhead Trout Rainbow Trout Tilapia	Eastern Oysters Blue Mussels Clams Quahogs Abalone	
Prince Edward Island	Rainbow Trout Arctic Char	Blue Mussels Eastern Oysters	
New Brunswick	Atlantic Salmon Rainbow Trout Steelhead Trout Cod Halibut	Eastern Oysters Blue Mussels	Seaweed
Québec	Arctic Char Rainbow Trout Brook Trout Speckled Trout	Eastern Oysters Blue Mussels Sea Scallops	
Ontario	Rainbow Trout Arctic Char Tilapia Sturgeon		
Manitoba	Rainbow Trout Arctic Char		
Saskatchewan	Rainbow Trout Steelhead Trout		
Alberta	Rainbow Trout Tilapia		
British Columbia	Atlantic Salmon Chinook Salmon Coho Salmon Sturgeon Rainbow Trout Tilapia Sablefish	Pacific Oysters Manila Clams Varnish/Savory Clams Blue Mussels Mediterranean Mussels Japanese Scallops	Seaweed

Yukon	Arctic Char
Northwest Territories	Arctic Char

Source: Canadian Aquaculture Industry Alliance http://www.aquaculture.ca/files/production-markets.php

- **Pacific**: Among finfish, Atlantic salmon is the dominant species, with Chinook and Coho salmon and sablefish also farmed in marine waters. Salmon farms are located over a wide area: the Sunshine Coast, west coast of Vancouver Island, the Discovery Islands, the Broughton Archipelago and the central coast around Klemtu. Several species of freshwater fish are also farmed including, rainbow trout, sturgeon and tilapia.

  British Columbia is also a major producer of farmed shellfish. Pacific oyster and various species of clam are the dominant species, with mussels and scallops also produced. Culture activity is concentrated in Bayne Sound, south of Comox.

- **Atlantic:** Atlantic salmon is the dominant species among finfish, with cod and halibut also farmed in smaller quantities. Salmon farming occurs in three main areas: in the waters of the Bay of Fundy off Charlotte County in southwest New Brunswick, on the south coast of Newfoundland in Baie D'Espoir, and along the south shore of Nova Scotia. Freshwater species produced include trout and Arctic Char.

  Shellfish farming – both blue mussel and oyster – is concentrated in Prince Edward Island, with both species also cultured in the other Atlantic Provinces and Québec. Quahog and scallop are also produced in small quantities.

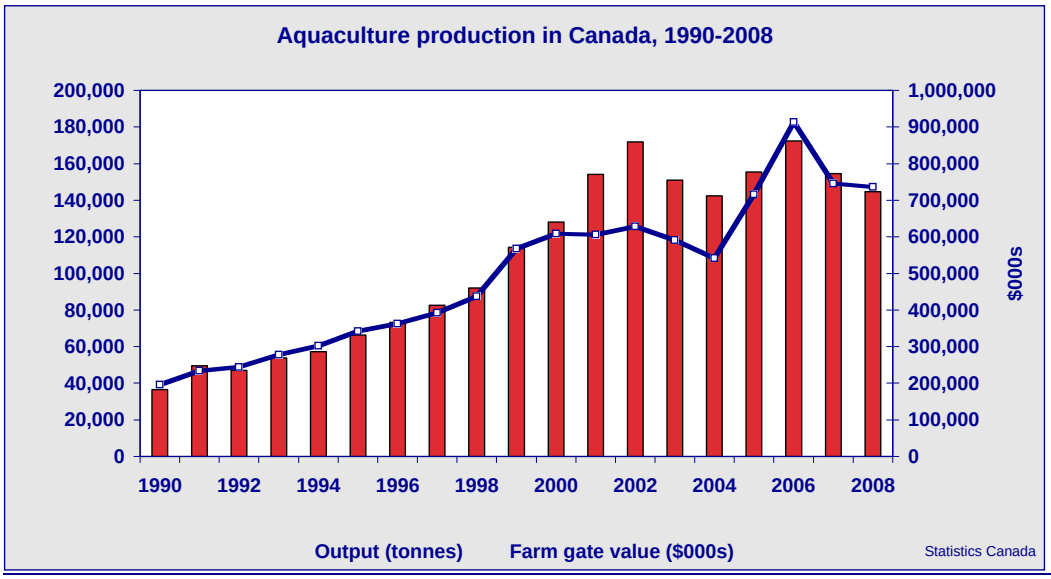
- **Ontario and Praries**: Rainbow trout is the main species among finfish, with Arctic Char, tilapia and sturgeon also farmed. Production is concentrated in Ontario, with smaller quantities produced in the Prairie Provinces and Yukon.

3. Production levels

National

Aquaculture production in Canada increased more than four-fold between 1990 and 2006. Output (in round weight equivalent tonnes) increased from 40,000 to 170,000 t, while farm gate value rose from $195 to just over $900 million (Figure 1). The decline in output value to the $740 million range in 2008 was due to price weakness and a cut in production on the east coast due to changes in the bay management system.

Figure 1



The quantity and value of national output is divided about equally between the Pacific and Atlantic coasts, though British Columbia leads all other provinces, typically accounting for about 50% of total production value vs. 25-30% for New Brunswick. Figure 2 provides a breakdown of output value by province, while Figure 3 gives a breakdown of quantity produced (tonnes) by species.

Figure 2

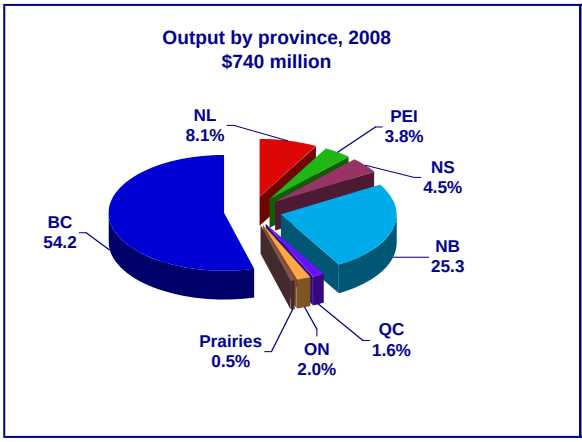
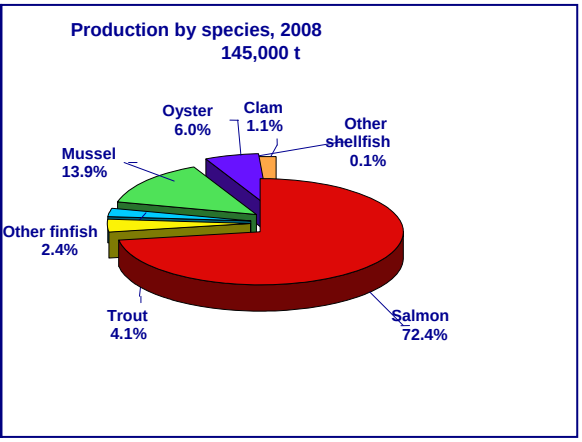


Figure 3



Source: Statistics Canada

British Columbia

A combination of favourable growing conditions and an abundance of suitable sites provided the basis for the rapid growth of Atlantic salmon production in British Columbia. Quantity produced increased from about 1,500 tonnes in 1990, reaching a peak of about 80,000 tonnes in 2002. The IHN virus caused production to drop to the 55,000 tonne range by 2004, but with improved biosecurity practices, production recovered to the 73,000 tonne range by 2008 (Figure 4).[8] The farm gate value of production followed the same general trend over the period, increasing from about $10 million in 1990, and exceeding $400 million in 2008 (Figure 5).

Shellfish production has doubled since 1990, increasing from 4,000 to 8,000 tonnes. By contrast, the farm gate value of output has increased about six-fold (from $3 to $18 million), reflecting strengthening markets and higher prices.

Figure 4

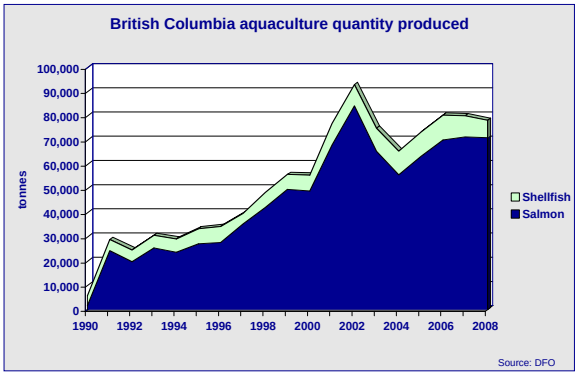
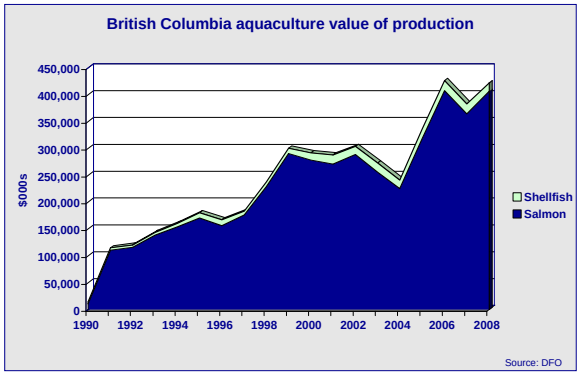


Figure 5



Atlantic Provinces

Aquaculture production also grew rapidly in the Atlantic Provinces over the past 15 years, with finfish output (mainly salmon) rising from about 7,500 tonnes to the 40,000 tonne range by 2002. A combination of disease, weak markets and industry consolidation caused output to decline to just over 30,000 tonnes during 2003-2005[9], with production recovering to the 45,000 tonne range in 2006. Adoption of a more stringent bay management system in New Brunswick has resulted in a reduction in the number of active sites to one-third of the total under licence and is reflected in the drop in production in 2007, with some recovery in 2008 (Figure 6).

With fluctuations, the farm gate value of output has almost quintupled, rising from $75 to $340 million in 2006 (Figure 7). The industry is recovering from the setbacks of 2007, with output value gradually rising to the $275 million range, up from $255 million in 2007. New Brunswick is the leading producer, with Newfoundland and Nova Scotia contributing an increasing share of output in recent years.

Shellfish output has increased at a similar rate over the period, rising from 6,500 to 30,000 tonnes. Output value (farm gate) has grown from $10 to just over $50 million. The blue mussel is the leading species, followed by oyster. Both species are cultured in each of the Atlantic Provinces with production concentrated in Prince Edward Island.

Figure 6

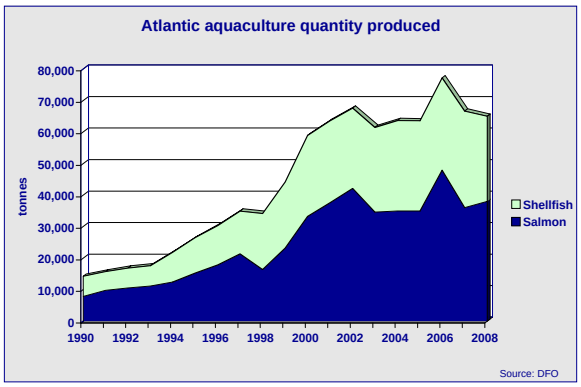
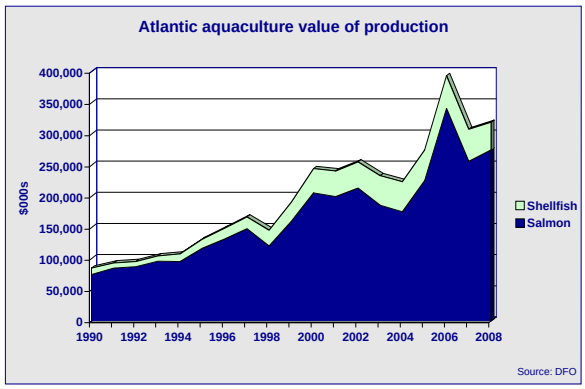


Figure 7



Ontario and Western Canada

Production (mainly rainbow trout) in the freshwater provinces – Ontario and the Prairies – and Yukon almost doubled between 1990 and 2007, rising from about 2,500 to 4,200 tonnes. Output value increased from about $14 to $17 million. Over 95% of output is produced in Ontario, most of it in waters of Georgian Bay off Manitoulin Island.

[8] IHN (Infectious hematapoetic necrosis) is a viral infection that attacks the kidneys and other organs of several species including wild and cultured salmon and trout. It is harmless to humans. The disease is managed in cultured species through vaccination, complete separation of infected fish and disinfection of fertilized eggs.

[9] The industry was struck with an outbreak of ISA (Infectious Salmon Anemia). ISA is caused by a virus (similar to flu) and occurs in primarily in wild and cultured Atlantic salmon, but can occur also in brown and rainbow trout. It is harmless to humans, but is lethal for salmon. Strict bio-security measures were introduced to reduce risk and prevent the spread of ISA including controlled harvesting methods, single year-class farm sites and a bay management system requiring a three-year rotation of sites to allow a year of fallowing between successive year classes.

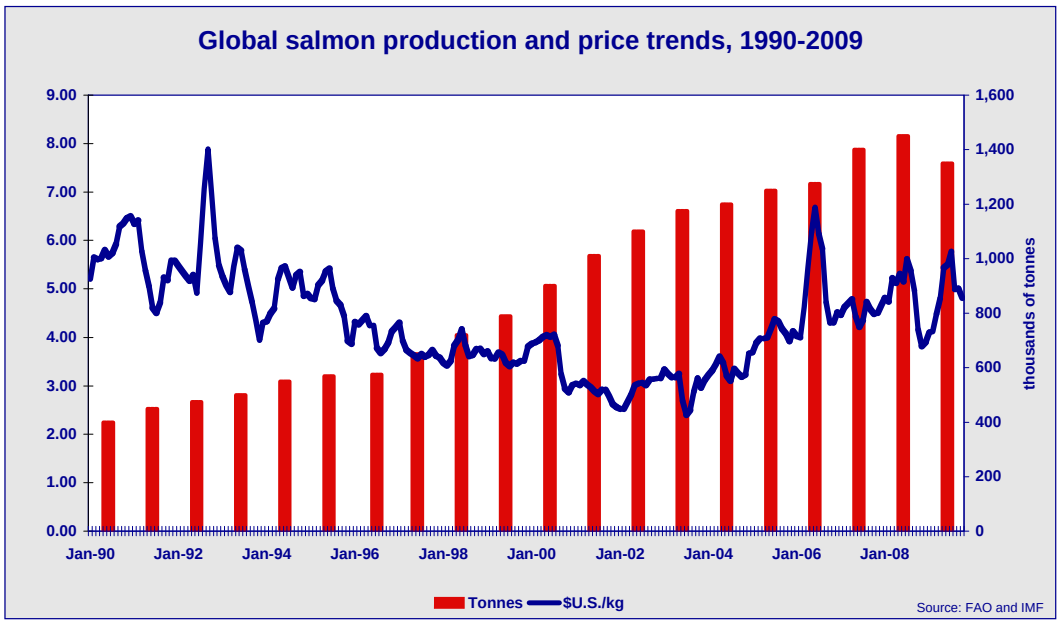
4. Competitive environment

Canadian aquaculture companies market their products internationally. The U.S. and Canada are the dominant markets because of their proximity to producing areas and the resulting ability of Canadian producers to supply them with fresh product. The market reach of shellfish producers tends to be regional, given the high unit transportation costs and challenges shipping a live product. By contrast, the market for finfish is global, especially for salmon growers.

That the market for salmon is international is both a good and a bad thing. On the plus side, it means growers have many options for selling product. On the negative side, it means competition from other producing nations. Though salmon was once a luxury good, with the development of large-scale production facilities in several countries, it has become a commodity. Among other things, this means that both its production and consumption have become highly price sensitive. The seafood and other protein choices open to consumers keep salmon prices in check. The growth of the industry has forced producers to operate as efficiently as possible in order to survive.

The story of the salmon industry in Canada and in the other major salmon growing areas (Norway, Chile and Scotland) may best be illustrated by the production and price data in Figure 8. As production increased during the 1990s and early 2000s, prices fell because demand did not keep up with supply. The industry performed very well at producing the fish, but not as well at developing the market for them. Through this period, the industry was marked by consolidations and bankruptcies.

Figure 8



In British Columbia during the 1980s there were some 100 companies active in the industry; there are currently four producing over 90% of the products. In New Brunswick, the numbers dropped from about 40 in the early 1990s to just four by 2006. As production leveled off in the 2004-2006 period and market development improved, prices began to increase and the industry stabilized. The industry in Canada is currently enjoying a boom period resulting from a sharp decline in production in Chile that began in 2008 and is expected to continue to at least 2011. The risk, of course, is that the industry will oversupply the market and cause prices to collapse

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3

ECONOMIC IMPACT

1. Notes on impact assessment methodology

Key concepts

Reporting on the impact of an economic activity generally begins with a descriptive profile of the activity, setting out its nature and economic characteristics and providing an overview of its linkages with other sectors in the broader economy. Key factors affecting performance and trends are discussed and quantified using industry-specific indicators. Relevant factors include resource conditions, regulatory framework and markets, with performance measured using such indicators as the quantity and value of production, number of establishments, employment and exports.

In producing its output, an industry also triggers activity elsewhere in the economy. The sum of this activity, generally referred to as *economic impact*, is conventionally measured with three indicators:

- **GDP:** an industry's contribution to Gross Domestic Product represents its broadest measure of economic impact. The domestic product of aquaculture captures the value it adds to purchased inputs (e.g., feed and utilities) through the application of labour and capital. GDP represents the sum of the value added by all firms in an industry. Value added should not be confused with output value, since the latter would include the value of purchased inputs.
- **Employment:** industry employment is important because of the significance generally attached to jobs; from a purely economic impact perspective, the significance lies in the economic impact generated through the spending of employment income. The greater the employment and higher the average income, the more significant the industry in terms of its overall economic impact. Unless otherwise indicated, employment is measured in full-time equivalents (FTE).
- **Labour income:** this captures payments in the form of wages and salaries earned in an industry. Returns to labour in the form of wages, salaries and earnings form a key component of GDP. Industries paying relatively high average wages and salaries generate a correspondingly higher economic impact than industries paying lower average incomes.

Economic impacts are generated through direct, indirect and induced demand in the economy expressed in terms of industry and consumer purchases of goods and services.

- **Direct impact:** refers to impact arising from the expenditures made by firms in the subject industry (in this case aquaculture) on the goods and services needed to produce

industry outputs. Direct activities include hatchery operations, grow-out, harvesting, processing and corporate administration and marketing.

- **Indirect impact:** refers to the impacts arising from purchased inputs triggered by the direct demand. For example, aquaculture companies buy feed, vessels and cages from manufacturers, and business services from biologists, technicians and divers. These companies in turn buy their inputs (e.g., fish meal and oil, steel and winches, plastics and netting, professional labour and equipment) from other companies, and so on. Taken together, the process of producing these goods and services creates profits, employment and income generating indirect impacts.
- **Induced demand:** refers to the demand created in the broader economy through consumer spending of incomes earned by those employed in direct and indirect activities. It may take a year or more for these rounds of consumer spending to work their way through an economy.

The sum of impacts flowing from each level of demand gives the overall economic impact of Canada's aquaculture industry. Generally, the greater the domestic supply capability at each level, the greater will be the economic impact. Conversely, the higher the import content, the weaker the domestic industry response (multipliers) and the lower the impact.

Quantifying the impacts – the Input-Output Model

Economists rely on economic models to quantify impacts. Models provide a simplified view of the economy, expressing the myriad demand and supply transactions in the productive process as a set of coefficients or quantitative relationships. These coefficients, including the level of employment and income generated per dollar of expenditure, are based on empirical measurement of flows in the real economy with data compiled through industry surveys conducted annually by Statistics Canada.

This study uses the Statistics Canada Inter-provincial Input-Output Model (2005 version) to generate the economic impacts. The use of an input-output (I-O) model is considered most appropriate for this study because this type of model:

- **produces direct, indirect and induced impact results** – the direct, indirect and induced impacts, provided it has "open" and "closed" versions. Running the open version allows labour income to "leak" out of the economy, with impacts confined to indirect effects. Running the closed version forces labour income to flow through the economy, resulting in an aggregate measure of indirect and induced impacts. The difference between the two runs represents the measure of induced impact. To determine induced impacts, Statistics Canada applies what it refers to as a partial closure of the model. This essentially captures first-round induced spending impacts, resulting in a conservative impact estimate.
- **produces results at a high level of resolution** – the I-O model is a matrix capturing inter-industry flows of purchases and sales, thus allowing impacts to be measured and reported at the highest resolution. Other types of models (e.g., general equilibrium and economic base) are structured at an aggregate economic level, lacking the sensitivity to accept industry-specific "shocks" and unable to produce industry-specific results.

Two disadvantages of using an I-O model are commonly cited: linearity of results and fixed inter-industry coefficients.

- **linearity of results** implies that the economy does not encounter production constraints since the model will produce constant results according to the fixed coefficients embedded in it. This is a valid concern, though not one that affects this study given its scope and objectives (the study is not trying to measure the impact of a major change in expenditures that would be inconsistent with inter-industry relationships embodied in the I-O model).
- **fixed coefficients** imply lack of technological innovation and no shifts in spending as a result of global competition. This is a valid concern if the model is not up-dated regularly. But given how slowly structural change occurs in an economy, as long as the model relies on industry data no more than 3-4 years old, such dynamic effects would be reflected in the coefficients. The Statistics Canada Inter-provincial Input-Output Model meets this test since just two years separate the model version (2005) from the impact year (2007).

Data requirement, sources and limitations

The study requires data for two main reasons: to drive the I-O Model to generate economic impact estimates; and, to describe the aquaculture industry in sufficient detail to allow the reader to develop a clear understanding of the nature of the activity and the extent of its economic significance.

Quantifying economic impacts begins with data on the gross value of output for the aquaculture industry in each province. Gross value of output means revenues generated through sales of final product. Final product value is used rather than farm gate because it accurately captures the integrated structure of the industry and provides a complete indicator of overall activity.[10] Using the aquaculture industry coefficients, the I-O Model breaks down the revenues to specific expenditure categories including purchased inputs, wages and salaries and profit. As these expenditures work their way through the economy (as captured by the I-O Model), they generate the GDP, employment and labour income impacts the study aims to quantify.

To these ends, the data compiled in the course of the study meet four key criteria:

- **Consistency:** they allow for comparability across industries and provinces, and reflect standard economic theory describing measures of economic activity. This means the same data, methods and tools are used in each province where impacts are measured. The data originate with Statistics Canada or are consistent with Statistics Canada definitions. *All output values are expressed in current dollar terms.*
- **Comparability:** they are consistent over time so that changes can be observed and measured. Failure in this respect results in uncertainty about whether what is observed is due to real change or merely to definitional differences. This means using standard classifications for industries under consideration. The North American Industrial Classification System (NAICS) is used for this study.

[10] To illustrate, all but one of the salmon companies processes all or most of its own production, and where processing is carried out by others, these 2-3 companies processes exclusively salmon. With shellfish, fewer growers process their own production, but those who do also process for others.

- **Accuracy:** while aquaculture represents a distinct industry for which direct, indirect and induced impacts can be measured, adjustments may have to be made to eliminate double counting when calculating *total* impacts for certain indicators (e.g., employment). The potential for double counting occurs if Statistic Canada treats the growing and processing segments of the industry as independent industries for data collection purposes. For example, growing salmon is a direct activity in its own right, but also forms a key input for processing, thereby becoming an *indirect* activity of processing. Failure to make adjustments in data or results would lead to an overstatement of overall impacts.
- **Replicability:** data collection and methods should be ones that others can repeat so that the analysis can be carried out periodically allowing time series measures of aquaculture impacts. This means that data, methods and models used should be readily accessible for future analyses. For this reason, data definitions, sources and methods used to derive data, are carefully explained in the text, tables and appendices, and any assumptions made explicit.

The data used in this study to drive the I-O Model and produce impact estimates meet these criteria. They are obtained from Statistics Canada sources, with corroboration (where possible) by the consultants of output values and input costs from industry sources and provincial government sources. Notwithstanding the general reliability of the data, some points of clarification may be useful in understanding what the numbers mean and how they are applied in the analysis. This may also serve as a guide for future analyses of this kind.

- **Industry structure**: Aquaculture falls under NAICS #1125 – "establishments engaged in farm raising and production of aquatic animals in controlled environments and using various forms of intervention (e.g., net pens, cages, various suspension systems) to enhance production including stocking, feeding and protecting from predators and disease." Under this definition, the industry includes both hatcheries and grow-out facilities.

  Many growers also process their output. This is generally the case with finfish; by contrast, a high proportion of shellfish producers grow only, selling their output to processors (most often growers themselves) for final production and marketing. Whether Statistics Canada classifies an enterprise as an aquaculture company or a processing company (NAICS #3117) depends on how the enterprise is structured and where most of the value is created. In an integrated company, if more than 50% of the final product value is created in grow-out, then it is classified under NAICS #1125 (aquaculture); if more than 50% of the value is created in processing, then it is classified under NAICS #1137 (processing). The trouble is that it is not obvious from the data what is included where.

  To add to the confusion, the companies themselves do not necessarily conform to the Statistics Canada classification approach. In discussions with west coast salmon farming companies, it emerged that all classified themselves under NAICS #1125, regardless of corporate structure (i.e., even where processing assets may have been held in a different company or where processing is contracted out to a separate company on a fee for service basis).[11] By contrast, at least one salmon company on the east coast divides its reporting between NAICS #1125 and #3117 (starting in 2007), so the farm-gate value of output is reported under Aquaculture and the final product value is reported under Fish Processing.

[11] It is commonly accepted that the output from aquaculture and capture fisheries forms an input into the fish processing industry. This is generally so, but not always the case. For most companies, grow-out forms the dominant activity from a revenue standpoint, with processing handled as an adjunct activity within the enterprise or contracted out on a fee for service basis. In these circumstances, processing becomes an input cost to the aquaculture business activity, rather than the other way round.

This has created a discontinuity in the annual value added account data set, making it appear that aquaculture production declined sharply in 2007.

- **Aquaculture statistics**: Statistics Canada publishes annual production (tonnes and value at the farm gate), and value added data by province (Cat. No. 23-222-X). Production data are given by species; the value added account gives revenue data by species group, but aggregates input expenditures at the industry level. Data confidentiality is not an issue at the national level, though can be for some species in some years at the provincial level.

  Statistics Canada does not collect farm gate data directly from the companies, but obtains them from the provinces. The provinces do not use a uniform approach to compiling data; most obtain production figures directly from the companies as part of routine annual reporting, while at least one (in the case of salmon) estimates production from the number of smolt placed in that year class. Such estimates can be reliable providing mortality and average weight are closely tracked, and any abnormal harvesting patterns are taken into consideration (e.g., arising from the need to advance the harvest due to disease).

  The way aquaculture data are collected and reported presents some challenges for estimating impacts. This is because the data as reported do not necessarily capture all the aquaculture activity (hatchery, grow-out and processing) defining the industry. As noted above, depending on how companies are structured and report their results, some of the aquaculture value is found in fish processing. A province-by-province review of the data indicates this occurs with salmon in New Brunswick, and with shellfish in most provinces.[12] Consequently, adjustments to the output data are required to give the full picture. The adjusted values are given in Table 2.

- **Running the I-O Model**: running the Model would be a straightforward matter if the aquaculture industry were represented under a single NAICS classification, with production and financial data capturing hatchery, grow-out and processing activities. The analyst would then be confident that the model coefficients represent *all* direct activity and the corresponding multipliers would produce reliable impact estimates for all aspects of industry activity. In these circumstances, final product value (rather than farm-gate value) would be used to run the Model, targeting NAICS 1125. Based on discussions with Statistics Canada and aquaculture companies on the east and west coasts, this would appear to be the appropriate approach in all provinces except New Brunswick.

  New Brunswick is an exception because one company reports farm-gate value under NAICS 1125 and its final output value under fish processing, NAICS 3117. If the version of the Model used in the analysis reflects this reporting approach, then it would have to be run for both Aquaculture (using farm-gate value) and Fish Processing (using final product value), with adjustments at the indirect level to eliminate double counting.[13] As it turns out, the current Model version (2005) pre-dates this reporting approach, indicating that the model coefficients for NAICS 1125 capture *all* direct and indirect activity for aquaculture production in the province. But NAICS 3317 is used to estimate impacts arising from salmon imported to the processing plants in the province.

[12] Statistics Canada reports final product value for finfish in New Brunswick in 2007 as $130 million. Our estimate based on industry and provincial government product and price data is $273 million (Annex A). For shellfish, we use provincial output and final product price data to derive the estimates appearing in Table 2.
[13] If the impacts for both aquaculture and fish processing are estimated separately using an I-O model, then adjustments are necessary to avoid double counting if the results are added. This is because the aquaculture impact (direct and indirect) would be captured in its own right, and also as an indirect impact of the processing industry because it represents a major input to that industry.

2. Impact results

National

Value of aquaculture output

The value of output produced by the Canadian aquaculture industry in 2007 is estimated at just over $1.0 billion (Table 2).[14] This is the aggregate value of final products sold into the wholesale market by Canada's aquaculture companies. Final product value is built up from farm gate value and any value added gained through basic processing (e.g., dressing and filleting in the case of salmon or trout, and washing and grading in the case of mussels and oysters). Many finfish producers are fully integrated, conducting both grow-out and processing activities. Several shellfish growers process their own output and also process on behalf of other growers. We believe using final product value to drive the I-O model gives a more accurate picture of industry structure and activity than farm gate value.

Table 2
Aquaculture final product value ($000s)

	Finfish	Shellfish	Total
British Columbia	522,600	37,100	559,700
Ontario	17,000	-	17,000
Québec	12,700	1,000	13,700
New Brunswick	272,900	7,000	279,900
Nova Scotia	43,000	10,000	53,000
Prince Edward Island	1,900	56,000	57,900
Newfoundland and Labrador	38,800	5,600	44,400
Total	908,900	116,700	1,025,600

Source: Statistics Canada, Cat. No. 23-222-X;
British Columbia Ministry of Environment, British Columbia Seafood Industry Year in Review, 2007;
New Brunswick Department of Agriculture, Fisheries and Aquaculture, special tabulation;
Nova Scotia Department of Fisheries and Aquaculture; Aquaculture Statistics, 2007
Prince Edward Island Department of Fisheries and Aquaculture, Fishery Statistics, 2007;
Newfoundland and Labrador Department of Fisheries and Aquaculture, Aquaculture Highlights, 2007

Gross value of economic activity

Gross value of output measures the value of all goods and services – primary, intermediate and final – produced and consumed in the process of producing the final output of a particular industry, in this case aquaculture. It serves as a proxy for the level of economic activity involved

[14] Data limitations (Statistics Canada publication restrictions) prevent the inclusion in Table 2 of aquaculture value in the Prairie Provinces and the territories.

in the production process. This activity occurs in the province where aquaculture takes place, and also the other provinces where supply and service industries are located. The gross value of output generated by aquaculture in Canada in 2007 was $2.1 billion (Table 3).[15]

Table 3
Gross value of output by province ($000s)

	Aquaculture output value ($000s)	BC	NB	NS	NL	PE	ON	QC	Other	Total
BC	559,700	946,129	1,650	1,710	864	182	69,915	67,343	134,006	1,221,799
NB	279,900	11,388	400,038	47,429	7,058	5,745	51,367	45,817	19,414	588,256
NS	53,000	688	6,485	79,587	855	496	10,120	4,085	2,902	105,218
NL	44,400	444	2,329	5,418	65,791	288	7,448	2,539	3,442	87,699
PE	57,900	374	4,229	1,931	427	70,633	3,281	1,394	839	83,108
ON	17,000	1,073	76	183	81	26	26,372	1,583	1,269	30,662
QC	13,700	337	204	163	144	27	1,137	19,623	892	22,526
	Total	960,432	415,012	136,420	75,220	77,399	169,639	142,384	162,764	2,139,270

Source: Statistics Canada Interprovincial Input-Output Model (2005 version)

Using gross value of output, Table 3 illustrates how important aquaculture in one province is to that province and to the other provinces in Canada. Reading horizontally gives the economic activity triggered across Canada by aquaculture production in each of the provinces listed in the left-hand column. Reading vertically gives the total activity in each province triggered by its own industry and the industries in the other provinces.

- **Aquaculture has extensive linkages across Canada**. Though most of the activity triggered by aquaculture occurs in the province of production (illustrated by the diagonal line of boxes in Table 3), supply and service industries in each province benefit at least in a minor way from aquaculture activity in every other province.
- **Aquaculture has extensive linkages within each province.** The dollar value of the level of economic activity in each province is about 1.5 times higher than the value of aquaculture output in that province. For example, in British Columbia, the dollar value of economic activity triggered by aquaculture output in 2007 was $946.1 million.
- **Aquaculture has strong intra-provincial linkages.** Across all provinces, the dollar value of the level of economic activity triggered by aquaculture in each province is about double the value of aquaculture output in that province. For example, aquaculture output was $279.9 million in New Brunswick in 2007 and triggered total economic activity valued at $588.3 million across Canada.

Gross Domestic Product

In total, the aquaculture industry generates just over $1.0 billion in GDP in Canada (Table 4).

Aquaculture generated $321.5 million in *direct* GDP in Canada in 2007. The contribution to GDP represents the share of industry output ($1,025.6 million) that accrues as income to factors of production (labour income, profits and return of capital). Expressed alternatively, GDP is the value of output less the value of purchased inputs.

[15] Data limitations prevent the estimation of gross value of output value for the Prairie Provinces and the territories.

Table 4
Economic impact of aquaculture in Canada

	GDP ($000s)	Employment (FTE)	Labour income ($000s)
Direct	321,500	4,900	156,800
Indirect	450,400	6,400	241,200
Induced	233,300	3,200	107,900
Total	1,005,200	14,500	505,900

Source: Statistics Canada Interprovincial Input-Output Model (2005 version)

The thousands of companies supplying goods and services to the aquaculture industry generated $450.4 million in *indirect* GDP in Canada in 2007. Among the main support and service industries are feed suppliers, equipment manufacturers, packaging suppliers and transportation. When spent in the wider economy, the incomes earned by those employed in direct and indirect activities generate $233.3 million in *induced* GDP.

Employment

The aquaculture industry created 14,500 full-time-equivalent (FTE) jobs in Canada in 2007. The total number employed exceeds this figure because of seasonal peaks in activity.

Direct employment in hatcheries, on farms, in processing plants and administration is estimated at 4,900 FTE. Another 6,400 FTE are created in *indirect* activities supplying aquaculture with goods and services. *Induced* activity adds a further 3,200 FTE.

Income

The aquaculture industry was responsible for just over half a billion dollars in labour income in 2007. This accounts for about half of total GDP. Total *direct* labour income was $156.8 million, resulting in average income of $32,000 per FTE employed in direct aquaculture activities. *Indirect* income earned by those employed in support industries was $241.2 million, with average incomes of about $37,700. Those employed in induced activities in the broader economy earned $107.9 million.

Regional

British Columbia

British Columbia is Canada's leading aquaculture area, with output valued at $559.7 million in 2007, accounting for about half the national value of output. The gross value of economic activity generated to produce this output was $946.1 million (Table 3).

The industry makes an overall contribution to provincial GDP of $425.3 million, comprised of $151.1 million in *direct*, $167.9 million in *indirect* and $106.3 million in *induced* impacts (Table 5).

Aquaculture generates about 6,000 FTE of employment, comprised of 2,220 FTE in *direct* activities, 2,330 FTE in *indirect* jobs and 1,410 FTE in *induced* activities.

The aquaculture industry was responsible for $223.3 million in labour income in 2007. This accounts for about half of total GDP generated in British Columbia by aquaculture. Total *direct* labour income was $78.4 million, resulting in average income of $35,250 per FTE employed in direct aquaculture activities. *Indirect* income earned by those employed in support industries was $95.1 million, with average incomes of about $40,900. Those employed in induced activities in the broader economy earned $50.4 million, for an average income of 35,700.

Table 5
Aquaculture impact in British Columbia

Value of output $559.7 million	GDP ($000s)	Employment (FTE)	Labour income ($000s)
Direct	151,100	2,220	78,400
Indirect	167,900	2,330	95,100
Induced	106,300	1,410	50,400
Total	425,300	5,960	223,900

Source: Statistics Canada Interprovincial Input-Output Model (2005 version)

Atlantic Provinces

Aquaculture makes a major contribution to the Atlantic Provinces economy, with output valued at $435.2 million in 2007. This accounts for about 40% the national value of output. The gross value of economic activity generated to produce this output was $616.0 million (Table 3).

The industry makes an overall contribution to regional GDP of $283.2 million, comprised of $154.7 million in *direct*, $72.6 million in *indirect* and $55.9 million in *induced* impact (Table 6).

Table 6
Aquaculture Impact in Atlantic Canada

Value of output $435.2 million	Newfoundland and Labrador	Nova Scotia	Prince Edward Island	New Brunswick	Total
GDP ($000s)					
Direct	20,000	22,800	42,800	69,100	154,700
Indirect	8,400	10,600	6,400	47,200	72,600
Induced	6,200	8,500	10,400	30,800	55,900
Total	34,600	41,900	59,600	147,100	283,200
Employment (FTE)					
Direct	215	380	790	1,100	2,485
Indirect	120	170	125	790	1,205
Induced	70	120	250	530	970
Total	405	670	1,165	2,420	4,660
Income ($000s)					
Direct	6,200	12,200	22,000	32,700	73,100
Indirect	4,900	6,400	2,900	28,300	42,500
Induced	2,200	4,800	6,400	16,800	30,200
Total	13,300	23,400	31,300	77,800	145,800

Source: Statistics Canada Interprovincial Input-Output Model (2005 version)

Aquaculture generates 4,660 FTE of employment, comprised of 2,485 FTE in *direct* activities, 1,205 FTE in *indirect* jobs and 970 FTE in *induced* activities.

The aquaculture industry was responsible for $145.8 million in labour income in 2007. This accounts for about half of total GDP generated in the Atlantic Provinces by aquaculture. Total *direct* labour income was $73.1 million, resulting in average income of $29,000 per FTE employed in direct aquaculture activities. *Indirect* income earned by those employed in support industries was $42.5 million, with average incomes of about $33,400. Those employed in induced activities in the broader economy earned $30.2 million, for an average income of $31,000.

Ontario and Québec

Aquaculture is an important source of employment and income in the Georgian Bay area of Ontario and in coastal areas along the Gaspé Peninsula in Québec. Trout farming produced $17 million in output in Ontario in 2007, while the Québec industry, diversified across several finfish and shellfish species, produced about $14 million. (Table 3).

The industries make an overall contribution to GDP of $30.2 million, comprised of $15.7 million in *direct*, $6.5 million in *indirect* and $7.9 million in *induced* impacts (Table 7).

Aquaculture generates 375 FTE of employment in these areas, comprised of 191 FTE in *direct* activities, 90 FTE in *indirect* jobs and 94 FTE in *induced* activities.

The aquaculture industry was responsible for $11.4 million in labour income in 2007. This accounts for about half of total GDP generated. Total *direct* labour income was $5.3 million, resulting in average income of $27,900 per FTE employed in direct aquaculture activities. *Indirect* income earned by those employed in support industries was $3.3 million, with average incomes of about $36,000. Those employed in induced activities in the broader economy earned $2.8 million, for an average income of $29,400.

Table 7
Aquaculture impact in Ontario & Québec

Value of output $30.7 million	Ontario	Québec	Total
GDP ($000s)			
Direct	7,480	8,220	15,700
Indirect	4,080	2,466	6,546
Induced	4,250	3,699	7,949
Total	15,810	14,385	30,195
Employment (FTE)			
Direct	110	81	191
Indirect	55	35	90
Induced	51	43	94
Total	216	159	375
Income ($000s)			
Direct	2,720	2,603	5,323
Indirect	2,040	1,233	3,273
Induced	1,530	1,233	2,763
Total	6,290	5,069	11,359

Source: Statistics Canada Interprovincial Input-Output Model (2005 version)

4

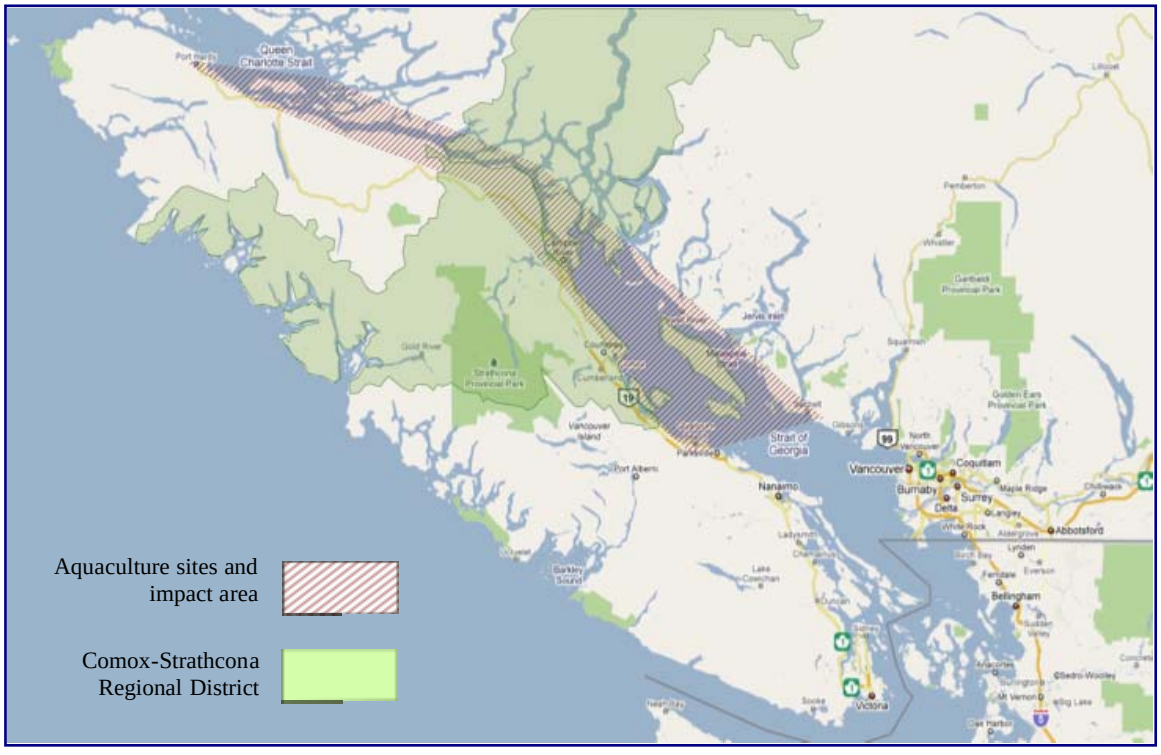
COMMUNITY IMPACT

1. British Columbia: Campbell River and Comox

Impact area

Assessing the economic impact of aquaculture at a community or sub-provincial level presents certain challenges. This is mainly because the geographic boundaries of the activity do not coincide with the boundaries used to gather and report statistical data on such indicators as population, employment and income. Accordingly, while it is possible to indicate the level of aquaculture activity occurring in the Campbell River or Baynes Sound areas, it is not possible to state with any precision what the impact in those particular areas is *relative* to the broader level of economic activity because suitable comparative data for those areas are not available. Instead, we rely on a larger geographic area – the Comox-Strathcona Census Division – for comparative purposes. The map in Figure 9 illustrates the areas where aquaculture takes place in and around the Comox-Strathcona district.

Figure 9: Comox-Strathcona area aquaculture activity



Economy

Overview

The Comox-Strathcona region of British Columbia has experienced positive growth over the past decade fueled in part by retirement in-migration and the real estate market. The economy is centred around retail services, public administration, health care, and tourism with most activity in the Courtenay-Comox hub. Aquaculture, forestry, agriculture and other resource industries are the key sectors in more rural areas. Campbell River (and North Vancouver Island more generally) forms the hub of salmon aquaculture activity, while shellfish production is concentrated in Baynes Sound, south of Comox.

Comox-Strathcona regional development efforts have placed particular emphasis on agriculture and related value-added industries as key economic sectors to promote and support. Aquaculture, organic crop, wine, and cheese production are examples of niche industries that have helped foster growth and development in the region. Table 8 sets out key indicators.

Table 8
Comox-Strathcona economic indicators

	1996	2001	2006	% Change
Population	97,666	96,131	101,595	4%
Employed	44,750	43,240	47,880	7%
Median Household Income	$41,539	$43,196	$48,252	16%

Source: Statistics Canada, Census data.

Population

The population of the Comox-Strathcona region was 101,595 in 2006, up 4% from 1996 (Table 8). Within the region, the most significant population growth has occurred in Comox, with an increase of approximately 10% over the same period. Campbell River saw moderate growth of about 2.5%. The population of the province as a whole grew over 10% over the same period.

Employment

Employment in the region rose 7% from 1996 to 2006 and has been dominated by manufacturing and construction, agriculture, retail, and health care / social services. The greatest change from 1996 to 2006 in industry employment was seen in the shift away from manufacturing, construction, and agriculture (15 to 20% decline) toward health care and social services (31% gain).

For the two major economic centres of the region, trends in employment are somewhat different. While both saw comparable increases in health and social services employment, much of the decline in Campbell River was split between agriculture (-15%) and manufacturing / construction (-15%). In contrast, Comox saw significant declines in retail sales (-21%), with major growth in education (41%) and accommodation and food service (34%).

During the decade between 1996 and 2006, Comox-Strathcona experienced a significant decline in unemployment with the number of unemployed dropping by one-third. The bulk of this decline occurred from 2001 to 2006 and was most significant in the Town of Comox (-24%) with notable change occurring in Campbell River (-16%).

Income

Median household income in the Comox-Strathcona region rose from $41,539 in 1996 to $48,252 in 2006 (Table A-1). This 16% increase was driven in large part by income growth of approximately 25% in Comox, with less significant growth in Campbell River (9%). By comparison, median household income in British Columbia as a whole increased approximately 25% over the same period. Average income in the area is about 8% lower than the median household income in the province as a whole ($52,700).

Aquaculture activity and impact

Activity and impact assumptions

The key question concerning impacts in Comox-Strathcona is how much of the total aquaculture activity and associated employment and income occurs in the area. To simplify the analysis, because most of the direct activity occurs in the impact area (Comox-Strathcona), we credit the area with the associated direct impacts. Industry information coupled with Statistics Canada data (value added account) suggests that of the total expenditures of $382 million made by the industry in 2007, about $290 million was made in the impact area (Annex B).

Much of the indirect activity also occurs in the impact area, though exactly what proportion is not known. Data provided by the aquaculture industry suggests it is likely to be in the 50-70% range (for example, about 40% of operating expenditures is made on feed for salmon which is imported to the area from Vanvouver), so to be conservative, we use the lower bound for estimating local employment and income impacts. The same assumption is used to derive induced impacts.

Table 9, setting out the resulting impacts, shows that aquaculture generated the equivalent of 4,550 full-time jobs in the Comox-Strathcona area and just over $150 million in labour income.

Table 9
Provincial and Comox-Strathcona impacts

	British Columbia		Comox-Strathcona	
	Employment (FTE)	Income ($000s)	Employment (FTE)	Income ($000s)
Direct	2,200	78,400	2,200	78,400
Indirect	2,300	95,100	1,650	47,550
Induced	1,400	50,400	700	25,200
Total	5,900	223,900	4,550	151,150

Source: Statistics Canada, Interprovincial Input-Output Model, 2005 version; industry estimates.

Aquaculture in Context

With the decline in forestry and the commercial fisheries, salmon and shellfish aquaculture occupy an increasingly important place in the economies of Campbell River and Comox. The major salmon companies are headquartered in Campbell River, as are many of the companies supplying goods and services including fish processing, nets and maintenance, transportation, packaging, containers, diving services, and machinery and equipment. Information provided by the salmon companies indicates that well over 200 firms in Northern Vancouver Island supply goods and services to the industry. Many of these are wholly dependent on the salmon aquaculture industry. Also, many of those employed on farm sites are based in Campbell River and its surrounding communities.

Table 10 puts the employment and income impacts in context by comparing them with regional totals. The data indicate that aquaculture accounts for about 10% of employment and income in the area. Caution is required in interpreting these results.

- First, owing to data limitations, the employment comparison understates the impact for two reasons: it mixes the number of persons employed in the area with the number of full-time equivalent jobs created by aquaculture; and, it compares a seasonal figure with an annual FTE figure. Census data corresponding to aquaculture industry data were not available.
- Second, again, owing to data limitations, an estimate of aggregate income in the region had to be developed that corresponds to employment income from aquaculture (this was done by adjusting Census median household income by netting out non-employment sources).

Table 10
Aquaculture impact in the Comox-Strathcona area

	Comox-Strathcona	Aquaculture	Aquaculture (of total)
Employment	47,880	4,550	9%
Income (000s)	$1,312,100	$151,150	11%

Source: Statistics Canada, *Census of Canada*, 2006 Community Profiles; Table A-2 (above)

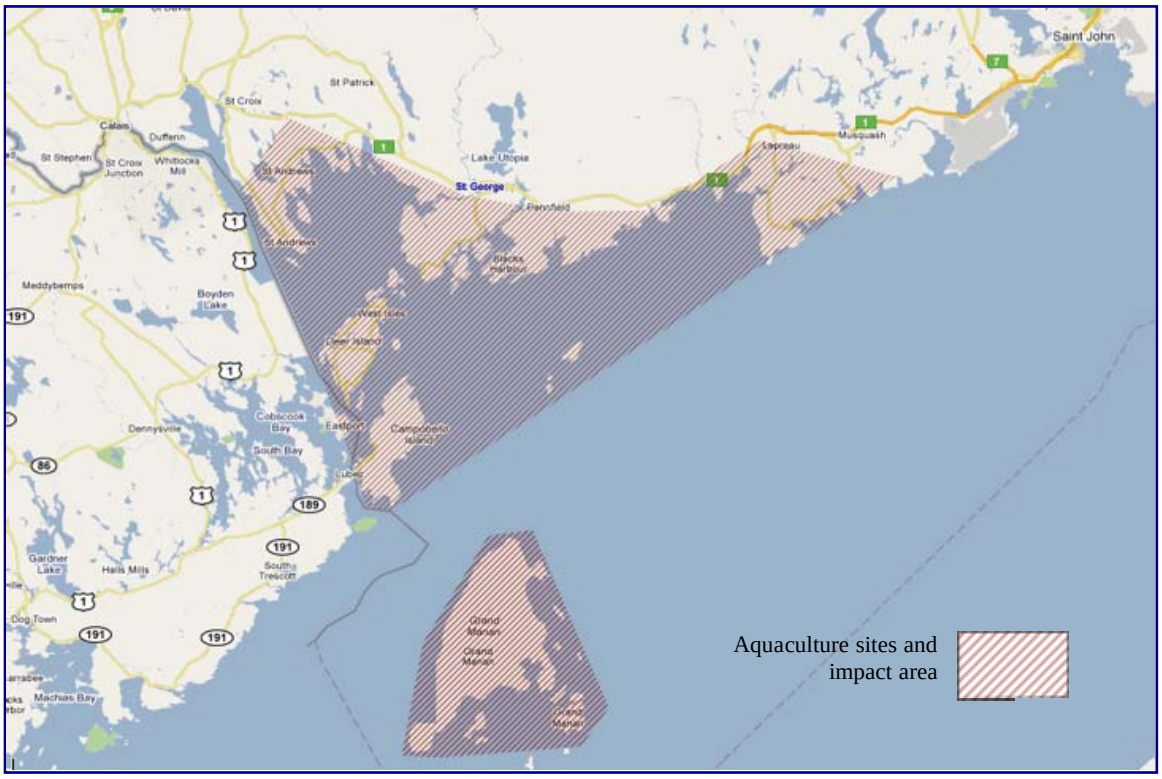
2. Charlotte County, New Brunswick

Impact Area

Assessing the economic impact of aquaculture at a community or regional level presents certain challenges. To derive reliable impact estimates it is necessary that there be a good fit between the geographic boundaries of the activity and the impact area, and that directly comparable data for the activity and the area are available.

Charlotte County provides a reasonably good fit with respect to boundaries. The aquaculture sites occupy the southwest corner of the County, with much of the associated *direct* and indirect activity located in the adjacent community of St. George. Estimating the impact of those particular activities *relative* to the broader level of economic activity presents more of a challenge because directly comparative data are not available but must be estimated from Census data. The map in Figure 10 illustrates the salmon farming areas, and the centre of land-based activity in St. George.

Figure 10: Salmon aquaculture areas in southwest Charlotte County



Economy

The economy of Charlotte County is dominated by aquaculture and fishing, as the region has become a hub for salmon aquaculture and its supporting industries. Much of the employment growth in the county can be attributed to the expansion of the industry as other sectors have stabilized or declined. While St. George has become the primary centre of activity, other towns such as St. Stephen, have experienced growth in financial services and retail linked directly and indirectly to the aquaculture industry. Charlotte County is also a hub for the many forest related businesses in the region. Tourism is an important economic driver for destinations like St. Andrews and Grand Manan, which have seen significant growth as a tourism destination over the past decade.

Table 11
Charlotte County economic indicators

	1996	2001	2006	% Change
Population	27,335	27,366	26,898	-2%
Employed	10,400	11,571	11,635	12%
Median Household Income	$33,656	$38,073	$40,897	22%

Source: Statistics Canada, Census data.

Population

The population of Charlotte County declined 1.6% from 27,335 in 1996 to 26,898 in 2006, while the population of the province as a whole declined 1% over the same period (Table 11).

Labour

Employment in Charlotte County increased approximately 12% from 1996 to 2006. That increase was driven in large part by significant gains in employment in both health care and social services (29%) and resource activities including aquaculture (22%). These major gains were offset to some extent by job losses in both manufacturing / construction (-29%) and retail (-4%).

Income

Both median household and median personal income made significant gains in Charlotte County over the decade ending in 2006. Median household income increased 22% from $33,656 to $40,897. Over this period, provincial household income increased by 28.9% (from $35,064 to $45,194).

Activity and impact assumptions

Aquaculture has transformed Charlotte County from a high unemployment-low income area to one of relative prosperity within the province. Though income and employment levels remain below provincial averages, the County has made substantial gains over the past 20 years from an economy characterized by seasonal employment and limited opportunity. Aquaculture and its supply and service industries offer year-round employment and good incomes in an export industry that has become the foundation of the local economy.

A key question concerning local impacts is how much of the total aquaculture activity and associated employment and income occurs in the area. Industry information coupled with Statistics Canada data (value added account) suggests that of the total expenditures of $205 million made by the industry in 2007, about $150.0 million was spent in the impact area on direct and indirect inputs (Annex B). Because all of the direct salmon activity occurs in Charlotte County, we credit it with 100% of the associated *direct* impacts (Table 12).

Much of the *indirect* activity also occurs in the Charlotte County, though exactly what proportion is not known with certainty. Information provided by the aquaculture industry suggests it is likely to be in the 60-70% range (for example, about 40% of operating expenditures goes toward feed about half of which is imported to the area from Nova Scotia), so to be conservative, we use the lower bound for estimating local employment and income impacts. The same assumption is used to derive induced impacts.

Table 12
Provincial and Charlotte County impacts

	New Brunswick		Charlotte County	
	Employment (FTE)	Income ($000s)	Employment (FTE)	Income ($000s)
Direct	1,100	31,700	1,100	31,700
Indirect	770	27,700	460	16,600
Induced	520	16,400	310	9,800
Total	2,400	75,800	1,870	58,100

Source: Statistics Canada, Interprovincial Input-Output Model, 2005 version; industry estimates.

Aquaculture in Context

Salmon aquaculture occupies a major place in the economy of Charlotte County. All the production companies are headquartered in St. George, as are many of the companies supplying goods and services including processing, nets and maintenance, transportation, packaging, and machinery and equipment. A recent study indicates that some 100 firms supply goods and services to the industry. Many of these are wholly dependent on salmon aquaculture.

Table 13 puts the employment and income impacts in context by comparing them with regional totals. Some caution is required in interpreting these results.

- First, owing to data limitations, the employment comparison understates the impact for two reasons: it compares the number of persons employed in the area with the number of full-time equivalent jobs created by aquaculture; and, it compares a seasonal figure with an annual FTE figure. Census data corresponding to aquaculture industry data were not available.

- Second, again, owing to data limitations, an estimate of aggregate income in the region had to be developed that corresponds to employment income from aquaculture (regional income was estimated from number of employees and median earnings from employment. The average income from aquaculture is substantially higher than median income at the County level and this, coupled with the downward bias of the employment impact (see above), accounts for the relatively high income impact.

Table 13
Charlotte County aquaculture impacts

	Charlotte County	Aquaculture	Aquaculture (of total)
Employment	11,635	1,870	16%
Income (000s)	$222,800	$58,100	26%

Source: Statistics Canada, *Census of Canada*, 2006 Community Profiles; Table A-4 (above)

3. Northern / Eastern Prince Edward Island

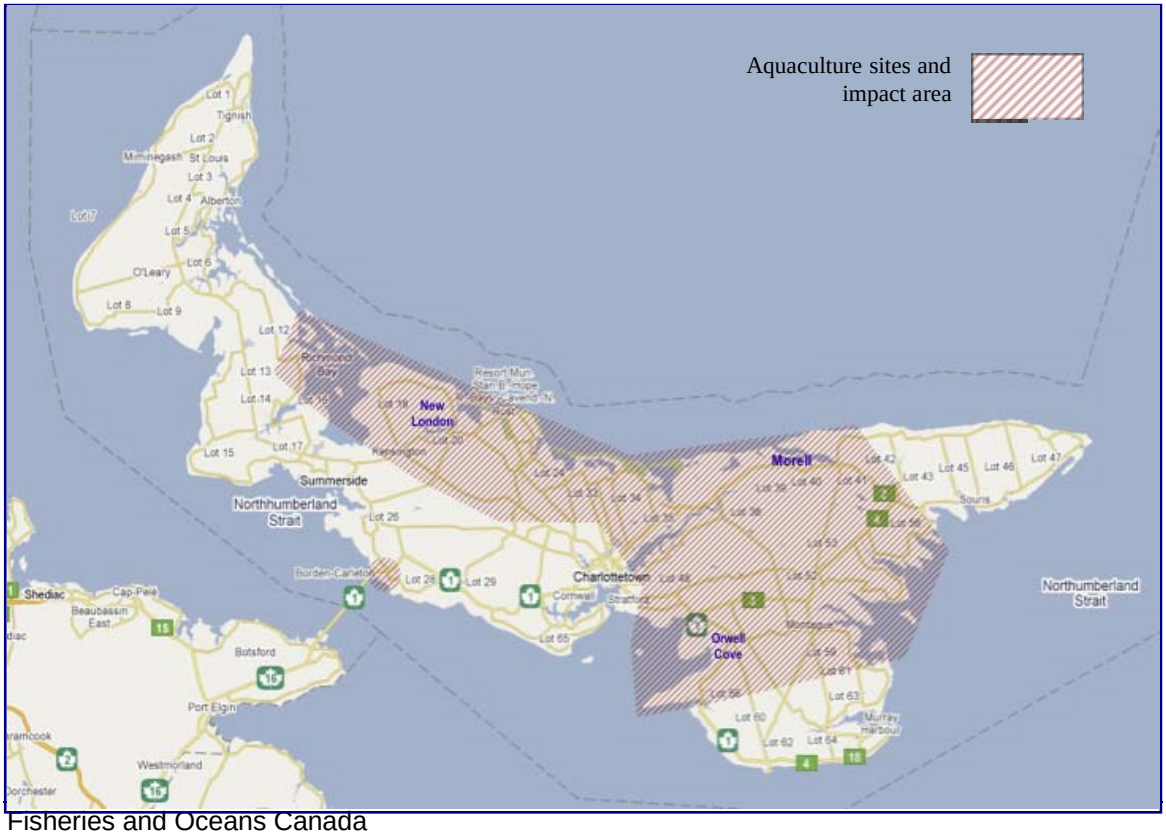
The Impact Area

Assessing the economic impact of aquaculture at a community or regional level presents a particular challenge in Prince Edward Island. This is mainly because grow out sites are widely distributed along the north and east coasts of the Island, with processing facilities in four locations, two of these some distance from the main growing areas. In short, the industry has no geographic centre that coincides with a well-defined community. While this may be a good thing for the hundreds of people in rural Prince Edward Island who work in the industry, it does require some creativity in defining an impact area.

The aquaculture impact area for Prince Edward Island (PEI) is derived from an aggregation of Census tract data capturing almost all of the aquaculture production and processing activity in the province. The impact area(s) is composed of several small, rural villages for which aquaculture provides one of the few sources of year-round employment and income. Data were collected at the census tract level allowing socio-economic indicators to be quantified, and these indicators were then aggregated to determine the industry's significance at the sub-provincial level. The communities profiled include those in and around the bays and estuaries with aquaculture production (Figure 11), including:

- Malpeque Bay
- New London Bay
- Murray River
- Tracadie Bay
- Boughton River
- Brudenell River
- Darnley Basin
- Rustico Bay
- St. Peter's Bay
- Cardigan Bay
- St. Mary's Bay
- Montague River
- Savage Harbour
- Hillsborough Bay

Figure 11: Areas of aquaculture activity in Prince Edward Island



Fisheries and Oceans Canada

Economy

Agriculture, fisheries and aquaculture play central roles in the communities profiled. The bulk of aquaculture activity occurs in 20 bays and estuaries across northern and eastern PEI, with mussel processing in Morell, Orwell Cove, New London, and Borden-Carleton. Agriculture and its related services, including processing, transportation and storage, are well-developed and form a cornerstone of many of these local economies. Tourism is a mainstay in the provincial economy as a whole, and is present in the communities profiled to varying degrees. Lobster fishing, of course, is also a major force though, like tourism and agriculture, it is highly seasonal. An important distinction between aquaculture and these other industries is that aquaculture is a year-round activity.

Table 14
PEI aquaculture impact area economic indicators

	1996	2001	2006	% Change
Population	22,005	-	22,323	1.4%
Employed	9,650	-	8,895	-8%
Median Household Income	$33,888	-	$46,913	38%

Source: Statistics Canada, Census data.

Population

Total population of the communities profiled increased from 22,005 in 1996 to 22,323 in 2006, equaling the provincial population growth rate of approximately 1% over the same period (Table 14).

Labour

Total employment in the communities profiled declined approximately 8% from 9,650 in 1996 to 8,895 in 2006.

Income

Though median household income (including income from all sources) in the impact area increased by 38% over the 1996-2006 period, total income from employment declined moderately, dropping 7% from $159 million in 1996 to $144 million in 2006.

Activity and impact assumptions

Aquaculture makes three important contributions to the impact area economy: it provides a year-round source of income and employment in an area that has traditionally experienced few alternatives to seasonal fishing and agriculture; it is a widely-distributed activity (geographically) and accessible to those who prefer a rural lifestyle; and, it creates (rather than circulates) wealth in the sense that aquaculture relies almost exclusively on export markets for its revenues.

A key question concerning local impacts is how much of the total aquaculture activity and associated employment and income occurs in the area. Industry information coupled with Statistics Canada data (value added account) suggests that of the total expenditures of $27.0 million made by the industry in 2007, about $24.0 million was spent in the impact area on direct and indirect inputs (Annex B). Because all of the direct production activity occurs in the Impact Area, we credit it with 100% of the associated *direct* impacts (Table 15).

The industry generates a modest indirect impact given the nature of the activity. Much of the *indirect* activity occurs inside the impact area, though exactly what proportion is not known with certainty. Information provided by the industry suggests it is likely to be in the 60-70% range, including such inputs as seed for grow-out, transportation, and maintenance and repair. To be conservative, we use the lower bound for estimating local indirect employment and income impacts. *Induced* impacts are assumed to fall in the same range.

Table 15
PEI and Impact Area impacts

	Prince Edward Island		Impact Area	
	Employment (FTE)	Income ($000s)	Employment (FTE)	Income ($000s)
Direct	640	17,800	640	17,800
Indirect	100	2,300	60	1,380
Induced	200	5,200	120	3,120
Total	940	25,300	820	22,300

Source: Statistics Canada, Interprovincial Input-Output Model, 2005 version; industry estimates.

Aquaculture in Context

Table 16 puts the employment and income impacts in context by comparing them with regional totals. The impact results indicate that aquaculture accounts for about 10% of the employment and income in the Impact Area. Some caution is required in interpreting these results.

- First, owing to data limitations, the employment comparison understates the impact for two reasons: it compares the number of persons employed in the area with the number of full-time equivalent jobs created by aquaculture; and, it compares a seasonal figure with an annual FTE figure. Census data corresponding to aquaculture industry data were not available.
- Second, again, owing to data limitations, an estimate of aggregate income in the region had to be developed that corresponds to employment income from aquaculture (regional income was estimated from number of persons employed and median earnings from employment). The average income from aquaculture is higher than median income in the Impact area and this, coupled with the downward bias of the employment impact (see above), accounts for the higher income impact.

Table 16
Rural PEI aquaculture impacts

	Impact Area	Aquaculture	Aquaculture (% of total)
Employment	8,895	820	9%
Income (000s)	$196,500	$22,300	11%

Source: Statistics Canada, *Census of Canada*, 2006 Community Profiles; Table A-10 (above)

4. Manitoulin Island, Ontario

Impact area

Assessing the economic impact of aquaculture at a community or regional level presents certain challenges. To derive reliable impact estimates it is necessary that there be a good fit between the geographic boundaries of the activity and the impact area, and that directly comparable data for the activity and the area are available.

Manitoulin Island provides a reasonably good fit with respect to boundaries. The aquaculture sites border the Island, with much of the associated *direct* activity located on the Island. Most of the firms providing supplies and services (*indirect* activity) are located off the Island in surrounding communities.[16] Estimating the impact of those particular activities *relative* to the broader level of economic activity presents more of a challenge because directly comparative data are not available but must be estimated from Census data. The map in Figure 12 illustrates the cage site areas around Manitoulin Island.

Figure 12: Aquaculture activity off Manitoulin Island

[16] See *Economic Impact of the Cage Culture Industry in Ontario*, HCA, 2006.

Economy

As a regional health care and social services centre, Manitoulin Island has seen a moderate level of growth in terms of population, employment, and income. Spurred by this growth and the region's status as an attractive retirement destination, the economy has shifted away from primary industry and toward services that cater to that demographic, such as retail, professional, and financial services. Although overall agricultural activity declined from 1996 to 2006, certain niche industries, such as aquaculture, beef, and dairy still play a significant role. With its natural amenities and numerous accommodation, food service, and activity options, tourism has also become a central driver of economic activity on the Island.

Table 17
Manitoulin District economic indicators

	1996	2001	2006	% Change
Population	11,747	12,679	13,090	11%
Employed	4,585	5,140	5,270	15%
Median Household Income	$31,441	$32,238	$39,645	26%

Source: Statistics Canada, Census data.

Population

Population of the Manitoulin district grew by approximately 11% from 11,747 in 1996 to 13,090 in 2006, slightly below the provincial population growth rate of 13% over the same period (Table 17).

Labour

Employment in the Manitoulin district increased moderately from 1996 to 2006, rising approximately 12% from 5,275 to 5,890. A substantial portion of this increase can be attributed to the 38% rise in health and social services related employment over the same period. Retail trade and education saw moderate gains (4 to 5%), while agriculture, forestry and fisheries lost over 11% of its 1996 share of employment. Though district's overall rate of unemployment dropped approximately 21% over the decade ending in 2006, at 10.4% it continued to be substantially higher than the provincial average of 6.4%.

Income

The Manitoulin district economy is structured towards low-income activities, with a median income two-thirds the provincial average. Median household income increased 26% between 1996 and 2006, rising from $31,441 to $39,645. By contrast, the provincial median household income grew approximately 34% to $60,455 in 2006.

Activity and impact assumptions

Trout aquaculture represents an important source of economic diversification for Manitoulin Island. The Island's relatively high unemployment rate reflects the challenges rural communities

face in generating sources of economic opportunity. Making productive use of local resources to earn income by "exporting" products contributes to the foundation of the local economy. The key question concerning local impacts is how much of the total aquaculture activity and associated employment and income occurs in the area. Because most of the *direct* activity occurs in the area (Manitoulin District) we credit it with the associated direct impacts (Table 18). Industry information coupled with Statistics Canada data (value added account) suggests that of the total expenditures of $8.7 million made by the industry in 2007, about $5.1 million was spent in the impact area (Annex B).

While aquaculture operations provide direct employment and income to local residents, virtually all the 100 or so companies supplying goods and services are located outside the impact area in communities in Northern or Southern Ontario. These include firms providing fish processing, feed, cage fabrication and maintenance, transportation, packaging, and machinery and equipment. In light of this, the local economy is not credited with any of the indirect or induced impacts.

Table 18
Provincial and Manitoulin District impacts

	Ontario		Manitoulin District	
	Employment (FTE)	Income ($000s)	Employment (FTE)	Income ($000s)
Direct	110	2,700	50	1,200
Indirect	55	2,000	-	-
Induced	50	1,500	-	-
Total	215	223,900	50	1,200

Source: Statistics Canada, Interprovincial Input-Output Model, 2005 version; industry estimates.

Aquaculture in Context

Table 19 puts the employment and income impacts in context by comparing them with regional totals. The data indicate that aquaculture accounts for about 1% of employment and income in the District. Some caution is required in interpreting these results.

- First, owing to data limitations, the employment comparison understates the impact for two reasons: it compares the number of persons employed in the area with the number of full-time equivalent jobs created by aquaculture; and, it compares a seasonal figure with an annual FTE figure. Census data corresponding to aquaculture industry data were not available.
- Second, again, owing to data limitations, an estimate of aggregate income in the region had to be developed that corresponds to employment income from aquaculture (regional income was estimated from number of employees and median earnings from employment.

Table 19
Manitoulin District economic impact

	Manitoulin District	Aquaculture	Aquaculture (of total)
Employment	5,270	50	1.0%

Income (000s)	$109,000	$1,200	1.1%

Source: Statistics Canada, *Census of Canada*, 2006 Community Profiles; Table A-4 (above)

5

MAJOR TRENDS AND OPPORTUNITIES

1. Success factors and opportunities for growth

Several factors have contributed to the rapid development and growth of the Canadian aquaculture industry over the past 20 years. The specifics vary by species and region, but generally, the key factors were:

- an abundance of sites with favourable biophysical conditions;
- improved understanding and development of techniques to enhance survival rates of fish and shellfish at early life stages;
- development of improved broodstock;
- improvements in grow-out and harvest technology;
- individuals and firms willing to take risk and work to develop the industry
- receptive markets
- favourable regulatory regimes in the late 1980s and 1990s
- publicly funded development programs

But growth has not been uniformly strong in all areas, even where potential in terms of biophysical conditions may have been favourable. Figures 13 and 14 show that, with some fluctuations, production of salmon reached a plateau on both the east and west coasts in the years after 2005, while shellfish production stabilized and then declined in 2008.

Figure 13

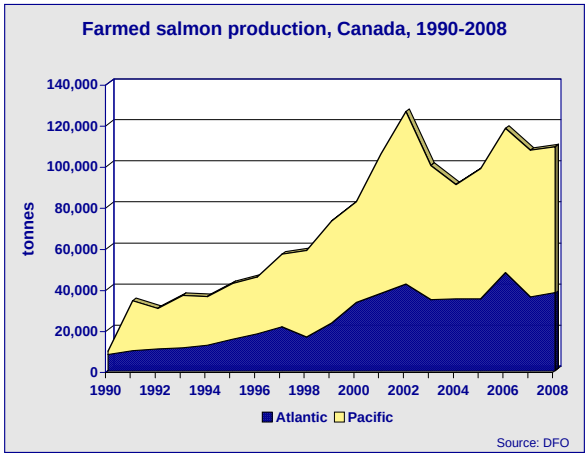
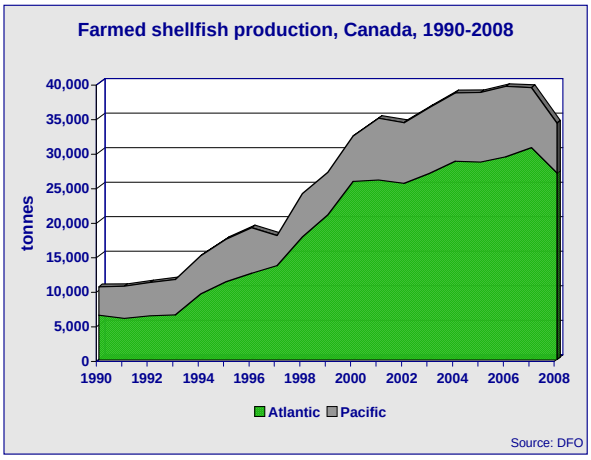


Figure 14



Looking ahead, there are opportunities for further growth, but the aquaculture industry in Canada faces several challenges. A list of factors contributing to industry strengths, weaknesses, opportunities and threats for each region is set out in Tables 20 to 22.

2. British Columbia

Salmon

Opportunities and challenges

According to industry sources, there is limited opportunity for growth in salmon production in British Columbia, but industry representatives indicate that, at best, the increase may amount to about 10% over current levels (70-75,000 t/year). Site productivity is considered a limiting factor; though the Ministry of Agriculture and Lands licences some 130 sites, some 30-40 of these are inactive because of low productivity. Achieving 10% growth hinges on access to more sites and amendments to increase production on existing sites

The industry currently finds itself well placed to take advantage of growth opportunities. It occupies a prominent position in the U.S., supplying high quality fish into a rising market. A downturn in supply from Chile has resulted in strengthening prices, circumstances that are likely to continue for the next 1-2 years. The industry is also structured to grow, having consolidated into four main companies from about 100 in the 1980s.

But several factors impede the industry's ability to grow and strengthen its market position. Among these is a regulatory process that is slow to approve new sites or amendments to existing leases. This leaves the industry with too many small, unproductive and high cost sites. Poor social licence arising from the public's belief that salmon farming is responsible for damage to wild stocks undoubtedly contributes to the slow pace of regulatory approvals. Provincial duty to consult and accommodate First Nations' rights and title interests must be factored into decision-making processes and timelines.

Table 20
SWOT analysis for British Columbia aquaculture

	Salmon	Oyster/clam
Strengths	▪ Close to strong U.S. market ▪ Rising prices/profitable industry ▪ Excellent fish health ▪ Consolidated industry ▪ Excellent support services industry	▪ Good biophysical conditions ▪ Strong local/regional market
Weaknesses	▪ Poor social licence ▪ Slow regulatory process ▪ Below optimal biophysical conditions ▪ Small farms/high production costs ▪ Poor investment climate	▪ Fragmented industry ▪ Small production units ▪ Poor investment climate ▪ Limited seed production ▪ Limited technology transfer
Opportunities	▪ Scope for growth in exposed sites ▪ Area separation/management & reduced risk ▪ Market strength through closer retail links ▪ Agreements with First Nations ▪ Value added processing	▪ Increased site productivity ▪ Room for expansion ▪ Scope for species diversification ▪ Export market

Threats	▪ Reduced output: disease and sea lice ▪ No growth: no access to new sites ▪ Price pressure: Norway enters U.S. market ▪ Profitability: stronger Canadian dollar ▪ Operations: labour shortages	▪ No growth: opposition to expansion ▪ Reduced output: water quality/disease ▪ Operations: labor shortages

In addition to the challenges of achieving growth within the constraints of a slow regulatory process, the industry cites a number of threats to current levels of profitability. Norwegian producers are making a concerted effort to expand into the U.S. market, filling the void left by Chile. This would mean downward pressure on prices and reduced market share. The stronger Canadian dollar also means reduced profits, given the substantial dependence on the U.S. market (over 70% of production). Finding adequate supplies of labour for farm and processing operations is not currently an issue due to the economic downturn. But labour shortages have caused difficulties in the past and could do so in future when the economy recovers.

Gaining access to new sites means developing mutually beneficial operating agreements with First Nations, on whose lands many of these high productivity sites are located. Several of these agreements are already in place. Their objectives are to facilitate dialogue with First Nations, encourage and provide a framework for direct participation in the industry, and provide operational security for the company and potential for growth. If implemented effectively, protocol agreements create capacity amongst First Nations and generate economic opportunity. The participation of the Kitasoo First Nation represents one of the leading examples of how aquaculture can benefit traditional communities. The Kitasoo operate a salmon farm and processing plant, which together, employ some 45 members of the Band and generate about $1.5 million in income annually.

Implications for linkage industries

The impact on linkage industries occurs more or less in proportion to the change in salmon production, though some industries could be more affected than others depending on whether the growth occurs through more productive use of existing sites, or through an expansion in the number of sites. For example, the impact on cage manufacturers, maintenance companies and dive companies depends mainly on the number of sites (and cages), while the impact on feed companies, transportation companies and suppliers of packaging and theraputants depends on the number of fish in the water.

Since industry growth is contingent mainly on access to new sites, then achieving industry growth of 10% could be expected to cause a proportional expansion in all support industries. Without knowing more about the capacity utilization of the various industries, it is probably safe to assume that all or most could handle a 10% expansion without needing to invest in new plant and equipment. In other words, the ability of linkage industries to meet the increased salmon industry production would occur primarily by increasing throughput and adding employees.

Shellfish

Opportunities and challenges

Studies indicate that the shellfish farming industry has considerable opportunity for growth, considering market potential, estimates of capable marine lands, and through productivity

increases.[17] But the industry has grown slowly over the past decade, and faces several challenges in meeting its potential.

With some notable exceptions, the industry is composed of many small family-owned enterprises. While this is a good thing from the perspective of indigenous development in rural areas, because the industry is composed of small production units it lacks the financial resources to support technological innovation, resulting in low productivity, low margins and difficulty attracting and retaining a labour force. A fragmented industry also faces challenges in conducting its marketing effectively. These characteristics combine to create a poor investment climate.

The opportunities for improved performance would appear to rest on securing greater productivity from existing sites and developing the market, both local and export. There is also a need to address public concerns about expansion based on environmental and aesthetic concerns. Public education and innovation are key to resolving these issues. And finally, improved performance is also going to hinge on resolving the difficulty the industry faces in meeting its labour needs. This will require time as the industry improves its margins through technological innovation and market development, allowing it to offer more attractive wages while also reducing labour dependence.

Implications for linkage industries

In the absence of projected growth in shellfish production that exceeds the growth rate of the past decade, and given the limited dependence by most producers outside resources, it is difficult to foresee more than a minimal impact on support industries.

3. Atlantic Provinces

Salmon

Opportunities and challenges

There is opportunity for growth in salmon production in the Atlantic Provinces. The bay management system introduced in New Brunswick in 2006 reduced the number of active sites in any year. Annual production capacity under favourable conditions is estimated at 45,000 t based on 11 million smolt stocked. The industry is currently stocking 7-8 million smolt, with production in the 35,000 t range. There is scope to expand in Nova Scotia, though biophysical conditions (risk of superchill) and public opposition limit the potential sites. Opportunity for expansion also exists in the Bay d'Espoir area in Newfoundland and Labrador, though no firm estimates of production potential are available.

The industry currently finds itself well placed to take advantage of growth opportunities. It is close to the U.S. and Canadian markets, and currently enjoying rising prices in both areas. The industry is also structured for growth, having consolidated into four main companies from about 40 in the mid-1990s. It also enjoys good social licence in most areas, contributing to a positive investment climate.

[17] See, Department of Western Economic Diversification, *Economic Potential of the British Columbia Aquaculture Industry*, 1998.

The industry cites a number of threats to its growth. Competition from Norwegian producers in the U.S. market would mean price pressure and reduced market share. The stronger Canadian dollar also means reduced profits, given the substantial dependence on the U.S. market (over 70% of production). Disease is a constant threat, though the new bay management system and the adoption of more stringent bio-security protocols reduces the risk considerably. Finding adequate supplies of labour for farm and processing operations is an on-going issue in New Brunswick, with at least one company needing to import foreign workers.

Table 21
SWOT analysis for Atlantic Provinces aquaculture

	Salmon	Mussel/oyster
Strengths	▪ Close to strong U.S. market ▪ Rising prices/profitable industry ▪ Good area separation/bay management ▪ Excellent fish health ▪ Consolidated industry ▪ Good social licence in most areas	▪ Good biophysical conditions ▪ Strong local/regional market ▪ Good market recognition
Weaknesses	▪ Limited scope for new nearshore sites ▪ Risk of "superchill" episodes ▪ Some imbalance in production due to NB bay management system	▪ Fragmented industry ▪ Poor market development ▪ Small production units ▪ High transportation costs ▪ Risk of seasonal closures
Opportunities	▪ Scope for growth in exposed sites ▪ Market strength through closer retail links ▪ Further value added processing	▪ Increased site productivity ▪ Coordinated marketing ▪ Increased production from new sites
Threats	▪ Reduced output: disease and sea lice ▪ No growth: no access to new sites ▪ Price pressure: Norway enters U.S. market ▪ Profitability: stronger Canadian $ ▪ Operations: labour shortages	▪ No growth: opposition to new sites ▪ Low margins: strong Canadian $ ▪ Operations: labour shortages ▪ Market: production continues to be demand limited

Implications for linkage industries

The implications for linkage industries follow the same logic as in British Columbia, with impact felt or less in proportion to the change in salmon production, though some industries could be more affected than others depending on whether the growth occurs through more productive use of existing sites, or through an expansion in the number of sites.

- In New Brunswick, 30% growth over the next several years is likely to occur through more productive use of existing sites as the companies adjust to the new bay management system. This means the growth effects would be felt by industries whose outputs are tied to number of salmon, not to number of cages. This includes companies supplying feed, packaging, transportation and processing services. Growth of this magnitude could be expected to result in an increase in capacity to meet the additional throughput requirements, and also result in increased employment in these support industries, most of which are located in Charlotte County.

- In Nova Scotia, modest growth is expected (1-2 new sites) due to the challenges in obtaining regulatory approval. The incremental impact on the industry can easily be accommodated within existing capacity.
- In Newfoundland and Labrador, we assume one additional site per year for the next few years. With some 12 sites currently in production, this would increase production by 5-10% annually. The incremental impact on the industry is likely to cause some expansion in support industries, though most of these are located outside the sparsely populated local area.

Shellfish

Opportunities and challenges

Based on estimates of biophysical capacity, the shellfish farming industry has opportunity for growth in Nova Scotia, New Brunswick and Newfoundland and Labrador, but limited growth potential in PEI. And though the industry enjoys a good position in the Canadian and U.S. markets, the market has not developed in step with the production capacity of the industry. As a consequence, the industry has struggled with low prices and small margins.

The industry throughout the region is composed of many small family-owned farm operations, with a few larger companies combining both farming and processing. This represents a good rural development model, but it also contributes to the overall weakness of the industry. Because the industry is composed of small production units it is characterized by low productivity, limited technological innovation, strong competition for market share, and ultimately low margins. PEI is the dominant producer, and its strong position in a limited market constrains production in other provinces where expansion is possible. In these circumstances, industry fragmentation and competition for market share tend to drive prices to low levels. These characteristics combine to create a poor investment climate.

The opportunities for improved performance would appear to rest on market development and the industry taking a more coordinated approach to marketing. Unless increased demand can elevate prices and margins, the industry seems destined to remain locked in a competitive spiral where any potential gains are undermined by price-cutting to secure sales.

Implications for linkage industries

Limited growth in production is expected over the next few years. Given the limited dependence by most growers on outside resources, it is difficult to foresee more than a minimal impact on support industries.

4. Ontario

Trout

Opportunities and challenges

The industry is based on access to sites offering excellent biophysical conditions, and proximity to a large market in southern Ontario. It also is supported by many businesses providing essential goods and services.

Though there is ample scope for expansion based on suitable space with good growing conditions, the regulatory regime is not seen as supportive by industry, and there is also opposition by adjacent landowners and cottage-owners. Some of this opposition is based on aesthetic considerations, and some on apprehensions about environmental damage.

The fear in the industry is that unless there is expansion, interest by the existing growers who have struggled to develop the industry could wane, making it difficult to sustain the enterprises through to a second generation, and making it impossible to attract new growers.

Table 22
SWOT analysis for Ontario trout cage culture

Strengths	▪ Excellent biophysical conditions ▪ Proximity to markets ▪ Committed producers ▪ Supportive supply and service industry
Weaknesses	▪ Absence of supportive regulatory system ▪ Competition from salmon in markets ▪ Misinformation about culture operations ▪ Limited public support for expansion
Opportunities	▪ Space and conditions for expansion ▪ Market development
Threats	▪ No growth: no access to new sites ▪ Price pressure: from Atlantic salmon/char ▪ Operations: misinformation

Implications for linkage industries

Limited growth in production is expected over the next few years. Consequently, it is difficult to foresee more than a minimal impact on support industries, and these could easily be accommodated within existing capacity.

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FUTURE RESEARCH REQUIREMENTS

1. Complete and consistent aquaculture industry data

Statistics Canada publishes annual aquaculture data – farm gate production and value and value added account – that should serve as a reliable basis for estimating industry impacts. For the most part they do. But we ran into instances where it was impossible: a) to reconcile certain data with information provided by industry; b) to reconcile certain farm gate with value added account data; and c) to be certain that the data captured the full extent of aquaculture activity in all provinces. These issues were eventually resolved, but not before Statistics Canada and the consultants spent considerable time clarifying concepts and methods.

With point a), Statistics Canada relies on the provinces to compile and report production data. But there are differences in how the provinces compile the data. If all provinces used the same approach (even a standard form) and obtained production reports directly from industry, this problem would disappear.

With point b), the issue can be traced back to how companies classify their operations: as aquaculture (NAICS 1125) or fish processing (NAICS 3317). There does not appear to be consistency in the approach used across the industry, and it is not clear from the provincial data which approach is used. This leads to confusion because differences and shifts from year to year may be attributable to real changes in production or to changes in industry classification; but it is not clear which.

Point c) flows from the classification problem in Point b). According to the NAICS an establishment's production may be classified under fish processing even though it is simply the processing branch of a company whose main business is clearly aquaculture. If such establishments are included under fish processing (and this is not clear from the data), then the value added account underestimates the final value of aquaculture production. There are instances of this in both finfish and shellfish.

The lesson in all this is that the data should not be taken at face value. The analyst needs to understand concepts and methods, and how to make adjustments to the data so that they convey an accurate picture of the industry. But to facilitate future studies of this kind, Statistics Canada may wish to consider setting up a satellite account for aquaculture that captures in a formal and consistent way the full value of industry activity.

2. Focus on the shellfish sector

By comparison with the salmon sector, little is known about the structure and operation of the shellfish farming industry. In large part this is because the shellfish sector tends to be populated

with small independent producers engaged in marginally viable production activities and unable to support organizations able to conduct or fund in-depth studies.

This presents a challenge for studies of this kind. The official statistics contain limited data on such key indicators as number of active tenures, ownership structure, industry employment and income levels. Gathering these and other data from hundreds of producers, many of whom are unwilling or too busy to respond to questionnaires, tends to lie beyond the resources of this kind of general study.

But in order to provide even a general picture of the sector, provincial licencing authorities or industry associations should routinely gather these basic data. One province gathers these data periodically, but others do not and the data gaps generally tend to be substantial.

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ANNEX A: DERIVATION OF SALMON OUTPUT

New Brunswick salmon production				
	Farm gate	Final product		
		Whole (60%)	Fillet (40%)	Value
Output (t)	32,000	19,200	7,424	
Price ($/kg)	5.00	6.16	11.43	
Value ($000s)	160,000	118,272	84,856	**203,128**

Imports to New Brunswick: 11,000 t from NS and Maine				
	Farm gate	Final product		
		Whole (60%)	Fillet (40%)	Value
Output (t)	11,000	6,600	2,552	
Price ($/kg)		6.16	11.43	
Value ($000s)		40,656	29,169	**69,825**

Total value final product including imported fish **272,954**

Note
1. Tonnage (32,000) is based on assumed steady state capacity
2. Product split based on industry estimates
3. Fillet weight based on 40% of production and 58% yield
4. Product price based on US import price adjusted for exchange rate

*Derivation is necessary because of concerns about data accuracy and because 2007 is not a representative year for the industry.

Impact of $203.1 million aquaculture (1125)	GDP	Employment	Income
	$000s	FTE	$000s
Direct	62,900	938	28,400
Indirect	32,500	548	18,300
Induced	22,300	386	12,200
Total	117,700	1,872	58,900

Impact of $69.8 million processing only (3317)	GDP	Employment	Income
	$000s	FTE	$000s
Direct	4,007	140	3,287
Indirect	13,584	221	9,371
Induced	7,678	133	4,188
Total	25,269	494	16,846

Total Impact	GDP	Employment	Income
	$000s	FTE	$000s
Direct	66,907	1,078	31,687
Indirect	46,084	769	27,671
Induced	29,978	519	16,388
Total	142,969	2,366	75,746

Source: Statistics Canada Interprovincial Input-Output Model (2005 version)

*VALUE FOR NEW BRUNSWICK**

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ANNEX B: DERIVATION OF REGIONAL SHARE OF TOTAL PROVINCIAL AQUACULTURE EXPENDITURES

	NL	PE					NS	NB				
		1	2	3	4	5		1	2	3	4	5
A. Sources of output			% of costs		% to NE	$ to NE			% of costs		% to CC	$ to CC
Sales of aqua products/services	33,840	28,466					41,200	287,500				
Whole fish dressed, fresh or chilled	..	..					15,000	192,000				
Fish eggs & live fish for grow-out	..	..					10,000	16,000				
Whole fish live (ex for grow-out)	..	..					100	x				
Whole fish dressed & frozen	..	..					500	0				
Fish fillets, fresh or frozen	..	..					x	x				
Fish, dried, smoked or in brine	..	..					x	0				
Total finfish	28,400	x					31,000	280,000				
Total molluscs	x	27,300					x	x		3,400		
Other goods & services NES (3)	x	x					x	x				
Subsidies	x	x					x	x				
Other operating revenue	x	x					x	x				
Total operating revenue	34,000	28,791					41,740	292,800				
Change in inventory value - goods	10,437	4,320					6,200	14,000				
Gross output	44,437	33,111	1.00	46,900	0.88	41,272	47,940	306,800	1	272,954	1.00	185,498
B. Product inputs	31,495	8,105	0.24	11,480	0.90	10,332	16,450	230,200	0.750	204,804		117,082
Feed	12,900	x					8,500	89,400	0.291	79,537	0.50	39,769
Therapeutants	120	x					x	3,100	0.010	2,758	1.00	2,758
Purchases, eggs/fish for grow-out	10,000	2,800	0.08	3,966	1.00	3,966	3,000	32,000	0.104	28,470	1.00	28,470
Purchases, fish - processing/resale	x	60	0.00	85	1.00	85	x	53,900	0.176	47,954	0.00	0
Insurance premiums	1,000	320	0.01	453	0.88	399	400	6,300	0.021	5,605	1.00	5,605
Energy (electricity, fuel, etc.)	1,000	700	0.02	992	0.88	873	950	4,200	0.014	3,737	1.00	3,737
Goods transportation & storage	2,200	490	0.01	694	0.88	611	400	5,000	0.016	4,448	1.00	4,448
Processing services	x	x					x	12,700	0.041	11,299	1.00	11,299
Rental & leasing expenses	430	450	0.01	637	0.88	561	70	1,600	0.005	1,423	1.00	1,423
Maintenance/repairs, buildings	120	300	0.01	425	0.88	374	280	1,500	0.005	1,335	1.00	1,335
Maintenance/repairs, machinery	1,500	800	0.02	1,133	0.88	997	650	6,400	0.021	5,694	1.00	5,694
Professional services	385	310	0.01	439	0.88	386	400	3,000	0.010	2,669	1.00	2,669
Other operating expenses NES (3)	1,340	1,600	0.05	2,266	0.88	1,994	550	10,800	0.035	9,609	1.00	9,609
Change in inventory value -raw materials	726	-5	0.00	-7	0.88	-6	2,400	300	0.001	267	1.00	267
Total of product inputs	30,769	8,110	0.24	11,487	0.89	10,240	14,050	229,900	0.749	204,538		117,082
C. Gross value added (factor cost)	13,668	25,001	0.76	35,413	0.90	31,871	33,890	76,900	0.251	68,416	1.00	68,416
D. Selected primary inputs												
Salaries & wages	5,000	10,200	0.31	14,448	0.90	13,003	6,000	33,500	0.109	29,804	1.00	29,804
Employer portion of employee benefits	550	800	0.02	1,133	0.90	1,020	600	3,800	0.012	3,381	1.00	3,381
Depreciation	1,700	2,400	0.07	3,399	0.90	3,060	1,500	12,000	0.039	10,676	1.00	10,676
Interest paid	1,300	900	0.03	1,275	0.90	1,147	1,000	7,400	0.024	6,584	1.00	6,584
Other		10,701	0.32	15,157	0.90	13,642	24,790	20,200	0.066	17,972	1.00	17,972
Total regional expenditure ($000s)						24,263						150,267

Statistics Canada - Cat no. 23-222-XIE

Col 1 gives cost breakdown from Statistics Canada - Cat no. 23-222-XIE

Col 2 gives percentage distribution of costs

Col 3 derives cost breakdown for revised gross output amount (where necessary). Revised gross outputs are based on industry of final product value

Col 4 provides percentage of costs/expenditures allocated to the impact region. These percentages are based in industry interviews.

Col 5 gives the expenditures made in the impact areas based on the Col 4 percentages applied to the relevant total for product inputs. Regional expenditures are the sum of input costs allocated to the region and salaries and wages.

	QC	ON				BC						
		1	2	4	5	1	2	4	5	2	4	5
A. Sources of output			% of costs	% to MI	$ to MI		% of total	% to CR/C	$ to CR/C	% of total	% to CBS	$ to CBS
Sales of aqua products/services	13,600	17,050				546,750						
Whole fish dressed, fresh or chilled	1,400	..				457,800						
Fish eggs & live fish for grow-out	x	..				x						
Whole fish live (ex for grow-out)	8,000	..				0						
Whole fish dressed & frozen	0	..				x						
Fish fillets, fresh or frozen	x	..				x						
Fish, dried, smoked or in brine	x	..				x						
Total finfish	12,350	x				509,650						
Total molluscs	1,000	0				37,100						
Other goods & services NES (3)	250	x				1,550						
Subsidies	400	x				x						
Other operating revenue	300	x				x						
Total operating revenue	14,300	17,690				548,300						
Change in inventory value - goods	-570	-715				10,700						
Gross output	13,730	16,975	1			537,600	1	500,500	500,500	1.00	37,100	37,100
B. Product inputs	5,815	8,680	0.511			382,160	0.711		355,787	0.24		9,081
Feed	x	5,500	0.324	0.000	0	158,000	0.294	0.000	0		0.000	0
Therapeutants	55	65	0.004	0.000	0	7,700	0.014	1.000	7,169		0.000	0
Purchases, eggs/fish for grow-out	360	1,000	0.059	0.800	800	13,400	0.025	1.000	12,475	0.08	1.000	3,137
Purchases, fish - processing/resale	x	165	0.010	0.800	132	50,000	0.093	1.000	46,549	0.00	1.000	67
Insurance premiums	270	120	0.007	0.800	96	7,800	0.015	1.000	7,262	0.01	1.000	359
Energy (electricity, fuel, etc.)	1,300	800	0.047	0.800	640	9,600	0.018	1.000	8,938	0.02	1.000	784
Goods transportation & storage	180	100	0.006	0.800	80	37,000	0.069	1.000	34,447	0.01	1.000	549
Processing services	40	0		0.800	0	51,200	0.095	1.000	47,667		1.000	0
Rental & leasing expenses	60	200	0.012	0.800	160	3,500	0.007	1.000	3,258	0.01	1.000	504
Maintenance/repairs, buildings	210	50	0.003	0.800	40	1,200	0.002	1.000	1,117	0.01	1.000	336
Maintenance/repairs, machinery	500	100	0.006	0.800	80	22,000	0.041	1.000	20,482	0.02	1.000	896
Professional services	275	310	0.018	0.800	248	5,800	0.011	1.000	5,400	0.01	1.000	347
Other operating expenses NES (3)	615	285	0.017	0.800	228	15,160	0.028	1.000	14,114	0.05	1.000	1,793
Change in inventory value -raw materials	-500	-15	-0.001	0.800	-12	-200	0.000	1.000	-186	0.00	1.000	-6
Total of product inputs	6,315	8,695	0.512	0.800	2,492	382,360	0.711	1.000	208,691	0.24	1.000	9,087
C. Gross value added (factor cost)	7,415	8,280	0.488	1.000	8,280	159,560	0.297	1.000	148,549	0.76	1.000	28,013
D. Selected primary inputs												
Salaries & wages	2,100	3,000	0.177	0.800	2,400	53,000	0.099	1.000	49,342	0.31	1.000	11,429
Employer portion of employee benefits	300	300	0.018	0.800	240	10,000	0.019	1.000	9,310	0.02	1.000	896
Depreciation	1,200	720	0.042	0.800	576	31,500	0.059	1.000	29,326	0.07	1.000	2,689
Interest paid	1,000	1,000	0.059	0.800	800	13,600	0.025	1.000	12,661	0.03	1.000	1,008
Other	2,815	3,260	0.192	0.800	2,608	51,460	0.096	1.000	47,909	0.32	1.000	11,990
Total regional expenditure ($000s)					5,132				267,343			21,412

Statistics Canada - Cat no. 23-222-XIE

Col 1 gives cost breakdown from Statistics Canada - Cat no. 23-222-XIE

Col 2 gives percentage distribution of costs

Col 3 derives cost breakdown for revised gross output amount (where necessary). Revised gross outputs are based on industry of final product value

Col 4 provides percentage of costs/expenditures allocated to the impact region. These percentages are based in industry interviews.

Col 5 gives the expenditures made in the impact areas based on the Col 4 percentages applied to the relevant total for product inputs. Regional expenditures are the sum of input costs allocated to the region and salaries and wages.

ANNEX C: PROVINCIAL MULTIPLIERS: NAICS 1125 AQUACULTURE

	Multipliers within province									Multipliers in other provinces		
	GDP			Employment			Income			GDP	Employment	Income
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced		Direct/Indirect	
British Columbia	0.27	0.30	0.19	3.97	4.16	2.52	0.14	0.17	0.09	0.19	2.47	0.09
Ontario	0.44	0.24	0.25	6.45	3.23	3.00	0.16	0.12	0.09	0.10	1.26	0.04
Qu˘bec	0.60	0.18	0.27	5.92	2.53	3.13	0.19	0.09	0.09	0.09	0.99	0.04
New Brunswick	0.31	0.16	0.11	4.62	2.70	1.90	0.14	0.09	0.06	0.26	3.80	0.14
Nova Scotia	0.43	0.20	0.16	7.22	3.18	2.31	0.23	0.12	0.09	0.19	2.70	0.10
Prince Edward Island	0.74	0.11	0.18	13.61	2.19	4.27	0.38	0.05	0.11	0.09	1.27	0.05
Newfoundland and Labrador	0.45	0.19	0.14	4.83	2.68	1.58	0.14	0.11	0.05	0.19	2.72	0.10

Source: Statistics Canada Interprovincial Input-Output Model (2005 version)