



# The Canadian Farmed Salmon Industry

## Benchmark Analysis for the US Market

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### Final Report

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# Preface

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Agriculture & Agri-Food Canada retained GSGilson & Associates Ltd. to conduct a benchmarking study for Canadian farmed salmon.

The consultants have benefited from discussions with industry, government, and seafood buyers. Notwithstanding this assistance, GSGilson & Associates Ltd. has final responsibility for the analyses and conclusions of the study.

# Summary

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**Study Scope.** This benchmarking study compares the performance of the Canadian farmed salmon industry against the performance of major competitors, the Norwegian and Chilean farmed salmon industries, in the US market. Benchmarking is a management technique or tool that compares performance among organizations or business activities undertaking similar processes. Benchmarking provides a standard against which industry performance can be measured.

**Information Sources.** The research program included both primary (interviews) and secondary (literature review) research: interviews with 40 individuals from industry, governments, and seafood brokers/marketers/distributors, and reviews of 30+ reports and publications.

We did not conduct formal detailed financial surveys of the Canadian companies, for example in cooperation with an accounting firm, as this was beyond our Terms and Reference project scope and time and budget parameters.

**Canadian Production and Exports to US.** Canada produced 109 thousand tonnes of farmed salmon in 2005 or 8% of the total world production of 1.3 million tonnes. About 90% of both Canadian and world production was Atlantic salmon.

	2005 Farmed Salmon Production '000 tonnes*	2005 Farmed Salmon Imports to US \$ millions US		
		Whole Fish	Fillets/Other	Total
Canada	109	295	75	370
Chile	472	9	594	603
Norway	546	9	36	45
Other	196	29	27	56
Total	1,323	342	732	1,074

\* wet fish equivalents

About 40% of Canadian production comes from Eastern Canada, mainly New Brunswick, and 60% from British Columbia.

Canada is the dominant supplier of fresh, gutted whole farmed salmon to the US. Chile is the dominant supplier of value-added fillets, portions and other farmed salmon to the US market.

**Benchmarking Results.** The results of our benchmarking exercise are summarized in the attached Exhibit under five (5) major headings, namely: 1) biophysical conditions, 2) regulatory environment, 3) operating practices, 4) input costs and financing, and 5) market performance. The first four can be called “Structural Issues, the latter one “Market Issues”.

- biophysical capability – Canada has as good growing conditions as any place in the world and has the potential to expand production substantially

- government regulations & policy – Norway and Chile with their “single window” federal regulations are well ahead of Canada; the Canadian industry can not reach its potential due to regulatory gridlock
- operations – Norway is generally the strongest with its advanced infrastructure
- input costs – Chile with its cheap smolts, feed and labour is the lowest cost producer in the world (but Chile and Norway incur high air transport costs getting fresh product to the US); the Chilean labour cost advantage is most pronounced in value-added fillets and portions

**2004 Farm Level \$US/kg**

**Cost of Production\***

Canada	~2.60
Norway	~ 2.30
Chile	~ 1.85

*\* costs are representative and before freight, processing, packaging, selling costs & farm-level capital costs.*

- US market penetration – Canadian product has longer shelf life than Chilean product and receives a small price premium for this better quality; Canada finds producing whole fish more profitable than producing fillets; Norway essentially is excluded from the US whole fish market due to high tariffs

**Key Advantages & Disadvantages of Canadian Industry\***

**Advantage**

1. proximity to US market
  - high transportation cost advantage on perishable products
  - farm site to customer within 48-72 hours possible
2. quality of product
  - greater shelf life
  - water quality
  - food safety
3. familiarity with US
  - direct neighbours
  - similar language, culture

**Disadvantage**

1. cumbersome, inefficient regulations
  - lack of federal/provincial harmonization
  - prevents access to new sites, economies of scale
  - First Nations consultation onerous – no federal rules
2. lack of effective communications
  - health benefits of seafood
  - counteract ENGO falsehoods
  - market Canadian quality
  - garner political & community support
3. higher input costs
  - smolts, feed, labour

*\* apart from growing conditions*

The first two disadvantages, in our opinion, can and should be addressed. It is incumbent on government, with the constructive support of industry, to streamline the regulatory process and reduce the micromanaging of the aquaculture industry i.e., define reasonable performance standards and allow industry to determine the best way to meet and exceed them. Regulatory reform is the gatekeeper to industry viability and growth. There is a saying that “...uncertainty kills any business”. Regulatory certainty is a paramount issue for the Canadian farmed salmon industry.

Industry should address the second major disadvantage, the communication challenge. We believe that there is a major opportunity to educate the consumer, the community and the general public as to the health, community development and sustainability benefits of Canadian farmed salmon.

The third is a present “fact of life”, but something that may become less significant as lake access for smolt rearing in Chile is restricted, feed formulations change worldwide, and productivity improvements are realized in Canada.

The Canadian advantage is most prominent in the delivery of high quality, gutted whole fish to the US market by truck. This market segment is smaller and more specialized than the fillet market – other nations need to employ expensive air freight to access the US fresh salmon market e.g., it costs \$1.80US/kg to fly fish from Chile to the US.

Canada can produce high quality by stunning and bleeding the salmon with low stress at the farm site, dead hauling the fish to the Canadian plant where it is gutted prior to rigor, transporting the gutted whole fish to a US cheap labour facility where the fish, now out of rigor, can be cut into fillets or portions to exact customer requirements. This results in the ultimate freshness and shelf life to the end customer. And this quality advantage can extract a price premium. Canada should be the preferred supplier of fresh whole farmed salmon to the US.

Although producing fresh whole fish is our competitive advantage today, we do not recommend that Canadian industry produce only this product. Some Canadian producers have developed profitable niche markets for fresh fillets, skewers or portions. These markets should continue to be cultivated. Moreover, producing a variety of products reduces market risk – the market is capricious and can change rapidly. Finally, it is important for Canadian industry to maintain supply capability for fresh fillets, particularly if Chile withdraws somewhat from the US market due to high air freight costs. The US fresh fillet market could be much more attractive for Canadian producers in the future than it is today.

## Benchmark Elements for Competitiveness – Farmed Salmon

The competitive position of the Canadian, Norwegian and Chilean farmed salmon industries in terms of each of the following attributes is ranked on a score of 1 to 5 where 1 means very non-competitive and 5 mean very competitive, a score of 3 is neutral (higher scores mean less of an issue or cost than lower scores).

	Competitiveness Score			Comment
	Canada	Norway	Chile	
<b>Biophysical</b>				
1. Biophysical capability	4	2	2	CDN West Coast has huge potential, Chile has to move to next region
2. Invasive species/predation	3	4	3	No major differences – few seals in Norway
<b>Government Policy</b>				
3. Site applications/renewals	1	5	3	FN consultation major issue in BC, Norway & Chile don't require renewal
4. Compliance for operating sites	3	3	3	Similar regulations, Chile's based on CDN regulations
5. Introduction & transfers	2	5	4	Norway & Chile have access to premium stocks
6. Processing, inspection	3	4	4	CDN lacks GMO standards on feed
7. Trade issues - tariff	5	2	4	High Norwegian tariff on DR HD/ON product into US
8. - non-tariff	4	3	4	Canada & Chile have FTA with US, Norway does not
9. Animal welfare inc. research	3	2	4	Increasing importance – Norway will be 1 <sup>st</sup> to implement
10. Incentives, subsidies, R&D	3	5	4	Norway enjoys good gov't support
11. Indigenous people consultations	1	4	4	Bottleneck for new site approvals and renewals in BC
<b>Operations</b>				
12. Genetics	3	5	4	CDN BC (Mowi) stock reasonable, narrow St. John River stocks in East
13. Mortality up to harvest	3	4	1	Chile has SRS problems
14. Time to harvest – actual vs optimal	4	4	5	East Coast CDN & Northern Norway slow growing regions
15. Logistics/transportation	4	5	3	Good infrastructure in Norway
16. Access to skilled workers	4	5	2	Chile – problems in finding middle managers, but good plant workers
17. Access to services	4	5	4	Norway has longer history – many service providers
18. Management capability	5	5	5	Good upper management
19. Harvesting processes	3	4	4	Similar processes, East Coast CDN lags behind West Coast
20. Processing processes	3	5	5	Inefficient CDN East Coast plants
21. Continuity of supply	3	4	4	Economy of scale protects Norway & Chile
<b>Input Costs &amp; Financing</b>				
22. Smolts	2	3	5	Chile has cheap lake smolt production
23. Feed	3	2	5	Chile close to fish meal production
24. Transport - farm to plant	3	5	3	Long transport distance in Chile
25. - plant to US market	5	3	2	Big CDN advantage for fresh product, air freight for others
26. Direct Labour - farm site	2	4	5	Low wages in Chile, single shifts & automation in Norway
27. - processing	3	4	5	Skilled workers in Chile, automation in Norway
28. Crop insurance	2	4	3	Few companies offering insurance in Canada (BC)
29. Other operating	4	3	3	Norway can't dead haul fish, poor services in Southern Chile
30. Access to capital	4	5	3	Norwegian banks willing to finance – good economy in BC
31. Cost of capital	3	3	3	Interest rates similar
<b>US Markets</b>				
32. Pricing	4	4	3	CDN fresh advantage, Norway earns premium based on reputation
33. Quality	4	3	3	CDN fresh premium, West Coast still has Kudoa issue perception
34. Nutrition	3	3	3	Similar product attributes
35. Value e.g., taste, form, shelf life	5	4	4	CDN better shelf life, Chile wider product range
36. Packaging & preservation e.g., MAP	3	3	3	MAP of increasing interest to Chile
37. Food safety & traceability	3	3	3	Equal attention, Int'l consulting & technology
38. Process e.g., sustainability	3	4	3	CDN West Coast (& now Chile) subject to heavy ENGO scrutiny
39. Promotion & advertising	2	5	1	Some CDN companies doing brand promotion
40. Marketing approaches e.g, Boards	1	5	3	Norway has advantage in generic marketing

# Acronyms

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AAFC	- Agriculture and Agri-Food Canada
ACOA	- Atlantic Canada Opportunities Agency
AFA	- Aquaculture Framework Agreement
BCSFA	- BC Salmon Farmers Association
CAFI	- Canadian Agriculture and Food International Program
CAIA	- Canadian Aquaculture Industry Alliance
CEAA	- Canadian Environmental Assessment Act
CEO	- Chief Executive Officer
DEPOMOD	- DEPOsitional MODelling (computer model of deposition patterns)
DFO	- Canada Department of Fisheries and Oceans
DR HD/ON	- Dressed Head On
EC	- East Coast (Canada)
EN CAN	- Environment Canada
ENGO	- Environmental Non-Government Organization
EU	- European Union
FCR	- Feed Conversion Ratio
FN	- First Nation
FOB	- Freight on Board
FHMP	- Fish Health Management Plan
FTA	- Free Trade Agreement
IHN	- Infectious Hematopoietic Necrosis (a viral disease)
IPN	- Infectious Pancreatic Necrosis (a viral disease)
ISA	- Infectious Salmon Anemia (a viral disease)
MOU	- Memorandum of Understanding
NAAHP	- National Aquatic Animal Health Program
NBSGA	- New Brunswick Salmon Growers Association
NMFS	- US National Marine Fisheries Service
PBO	- Pin Bone Out
RSW	- Refrigerated Sea Water
SOTA	- Salmon of the Americas
SRS	- Rickettsia (a bacterial disease)
SVCRT	- Seafood Value Chain Round Table
WC	- West Coast (Canada)
WFE	- Wet Fish Equivalent

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## **1.0 Introduction**

### **1.1 Background**

The Canadian aquaculture industry of today and the business environment in which it operates is very different from that of 10 to 15 years ago. World aquaculture production has tripled, the influence of the environmental movement has escalated, and consumer tastes and demand have shifted.

Other changes relate to the effects of globalization, through the liberalization of trade, greater capital mobility, and technological advances in transportation, communications, and other services. From an economic perspective, national boundaries are essentially being erased. As a result, the Canadian aquaculture industry faces increased competition as well as increased opportunities.

Very large food discounters and large food broadliners selling a variety of foodstuffs have emerged. These companies source food from around the world and exert enormous influence on markets. There also has been dramatic consolidation in food retailing internationally. These changes confer increased power to the food distribution and retail sector, and decreased power to food manufacturers. The result is severe price pressure on margins for food manufacturing.

The aquaculture sector in Canada faces various constraints – from a lack of industry cohesion in some subsectors to inflexible government regulation to inadequate attention to consumer needs – that hinder adaptation to the new global business conditions. There is both a compelling need and substantial potential for industry and government to significantly enhance industry’s long-term viability.

The Seafood Value Chain Roundtable process launched by Agriculture and Agri-Food Canada (AAFC) has the goal of increasing the value, competitiveness and economic viability of the seafood sector in Canada. This study is one of a series of benchmarking studies aimed at comparing the structure and market position of the Canadian aquaculture industry against major competitors.

### **1.2 Study Objective**

The intent of this study is to conduct a benchmarking study of the Canadian farmed salmon industry in the US market. The study compares the performance of the Canadian farmed salmon industry for a formal set of indicators against the performance of major competitors, the Norwegian and Chilean farmed salmon industries (see Exhibit 1). The study also presents recommendations for change to improve the competitiveness of the Canadian farmed salmon industry.

Benchmark indicators are discussed under five major headings, namely: 1) biophysical conditions, 2) regulatory environment, 3) operating practices, 4) input costs and financing, and 5) market performance. The first four can be called “Structural Issues, the latter one “Market Issues”.

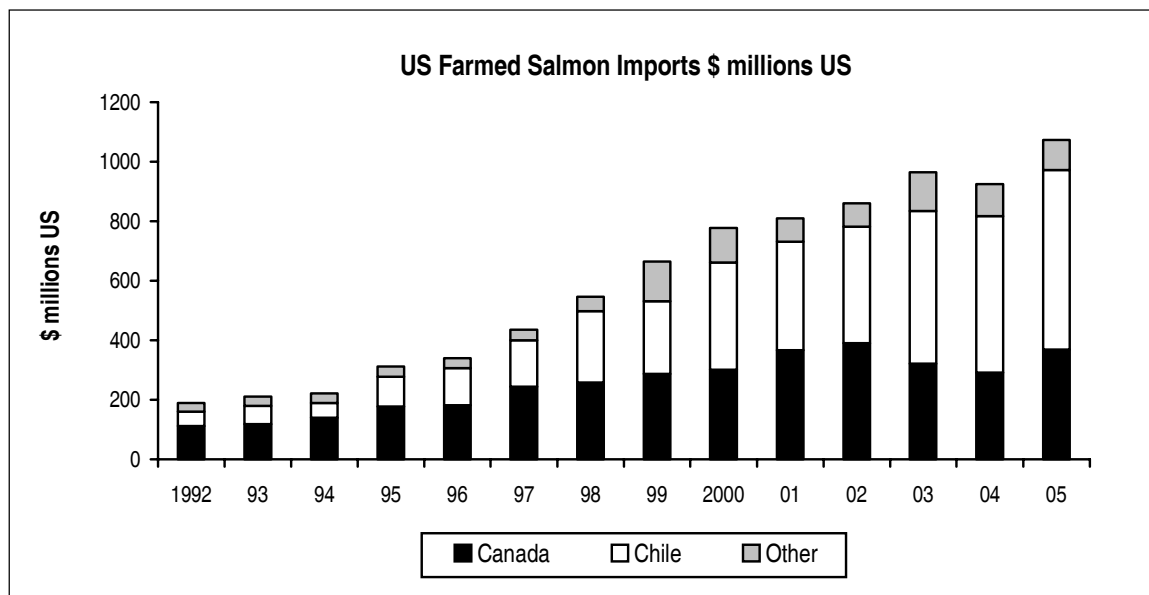
A business-oriented study is needed to support strategic planning in today’s changed world. All too often industry focuses on the constraint of inefficient, untimely and inflexible government regulation as a major impediment to improved viability. But there are initiatives that industry could pursue to improve competitiveness and viability that are totally under their control.

## Exhibit 1: World Farmed Salmon Production and Farmed Salmon Imports to US

	Farmed Salmon Production '000 tonnes*											
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
<b>Atlantic Salmon</b>												
Norway	207	249	292	316	343	411	422	411	444	508	537	546
Chile	34	54	77	97	107	102	167	245	268	281	346	381
UK	64	66	78	94	104	122	120	132	140	162	137	116
<b>Canada</b>	<b>30</b>	<b>34</b>	<b>39</b>	<b>52</b>	<b>59</b>	<b>67</b>	<b>79</b>	<b>99</b>	<b>112</b>	<b>92</b>	<b>89</b>	<b>96</b>
Faroe Islands	15	8	17	21	19	36	30	41	42	47	37	15
Others	34	35	41	46	49	52	55	60	50	54	47	50
<b>Total</b>	<b>384</b>	<b>446</b>	<b>544</b>	<b>626</b>	<b>681</b>	<b>790</b>	<b>873</b>	<b>988</b>	<b>1,056</b>	<b>1,144</b>	<b>1,193</b>	<b>1,201</b>
<b>All Salmon</b>												
Norway	207	249	292	316	343	411	422	411	444	508	537	546
Chile	68	98	144	170	184	172	260	378	377	391	449	472
UK	64	66	78	94	104	122	120	132	140	102	137	116
<b>Canada</b>	<b>38</b>	<b>43</b>	<b>49</b>	<b>63</b>	<b>71</b>	<b>77</b>	<b>89</b>	<b>111</b>	<b>126</b>	<b>109</b>	<b>107</b>	<b>109</b>
Faroe Islands	15	8	17	21	19	36	30	41	42	47	37	15
Others	64	56	60	63	64	71	75	82	70	71	66	65
<b>Total</b>	<b>456</b>	<b>520</b>	<b>640</b>	<b>727</b>	<b>785</b>	<b>889</b>	<b>996</b>	<b>1,155</b>	<b>1,199</b>	<b>1,288</b>	<b>1,333</b>	<b>1,323</b>

\* Wet fish equivalents or WFE (weight after starving & bleeding, but before gutting & processing).

Source: Kontali Analyse AS



Source: NMFS

### 1.3 Information Sources

The research program included both primary (interviews) and secondary (literature review) research:

- interviews with 40 individuals from industry, governments, and seafood brokers/marketers/distributors (see Exhibit A.1, Appendix A)
- reviews of several reports and publications (see Bibliography)

Interviews and report reviews include several from other countries such as the US, Norway, Chile, Iceland, and Europe. The consultants visited New Brunswick (Saint John, Letang, St. Stephen), Nova Scotia (Halifax), and British Columbia (Campbell River, Victoria) to interview industry and government officials.

For the industry interviews, we developed a three part Interview Guide – Part A: Overview of Competitive Position, Part B: Benchmark Scores for Competitiveness, and Part C: Typical Canadian Cost of Production Figures/Shares. The responses of each industry interviewee addressed at least one of the three components e.g., all did not provide cost of production or benchmark scores (many were not aware of operations in other countries).

We also developed a separate one page guide for our interviews with brokers/marketers/distributors.

The information in the report is presented at an aggregate level to preserve confidentiality.

Category	Interview Numbers		
	CDN	Int'l	Total
Industry	17	2	19
Government	11	3	14
Brokers/Distributors/Marketers	<u>1</u>	<u>6</u>	<u>7</u>
	29	11	40

### 1.4 Report Outline

The next section presents an overview of the Canadian industry, its activities, production and sales to the US market. It comprises the first of the remaining three sections of the report.

Section	Subject
2	The Canadian Industry
3	Benchmarks for Competitiveness
4	Conclusions & Recommendations

Several appendices provide supplemental material.

## 2.0 Industry Profile

Salmon farming is the growing of salmon in a controlled aquatic environment. Farmed salmon are reared from the egg stage to a market-sized product.

Akin to other livestock industries such as beef and poultry, the salmon farming industry can expand production to the limit of market demand, assuming sufficient access to suitable marine environments and technology. The industry has significant control over the timing and quantity of product shipped to market i.e., the industry holds the inventory in the water until it is opportune to market.

### 2.1 Industry Activities

The industry involves several linkages or activities between the aquatic environment and the final consumer. Our definition of the industry includes:

- **Hatchery phase** – the birthing and rearing of Atlantic salmon from broodstock eggs to smolt in a freshwater environment (normally a period of 12 to 18 months).
- **Growout phase** – the rearing and feeding of salmon smolts in sea cages to market size, i.e., “farming” (normally a further 16 to 24 month period).
- **Processing** – the harvesting and processing of grown fish into gutted head-on product or further-processed (i.e., value-added) steaks, fillets, portions etc. (including packaging and transport to consumer).
- **Marketing** – the selling of the processed products to wholesale markets.

Fish are starved for several days prior to harvest, to empty the digestive tract, and then bled, slaughtered and eviscerated. Whole gutted or dressed head-on fish typically weigh from 4 to 7 kg (9 to 15 lbs.) each. The fish are usually shipped in Styrofoam containers each containing 22 kg (50 lbs.) of product.

Not all of the above hatchery, growth, processing, and sales functions are performed by salmon farming companies. In some cases, third party companies supply smolts, custom process the fish, sell the finished products on a commission basis, and so on. In other words, the industry encompasses more than just the companies involved in the growout function.

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**Exhibit 2: Overview of the Canadian Farmed Salmon Industry 2004**


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	East	West	Canada
<b>Operations</b>			
Licensed Size of Farm Sites <sup>1</sup>	~2,300 ha	~ 1,300 ha	~ 3,600 ha
Number - Hatcheries	~ 20	23	~ 43
- Farm Sites <sup>1</sup>	~ 135	132	~ 267
- Processing Plants	5+	5+	10+
- Marketing Companies	5+	5+	10+
<b>Production</b>			
Production tonnes <sup>2</sup>			
Atlantic	40,300 <sup>3</sup>	42,400	82,700
Chinook	0	13,100	13,100
Other	0	800	800
	40,300	56,300	96,600
Product Mix			
Dressed Head-on	70%	80%	76%
Further Processed	30%	20%	24%
<b>Markets</b>			
Canada	40%	15%	25%
US	60%	80%	72%
Other	<1%	5%	3%
	100%	100%	100%
<b>Financial \$ millions</b>			
Product Value: Sales Value	250	294	544
- Sales/Processing Margin	50	82	132
= Farm Gate Value	200	212	412

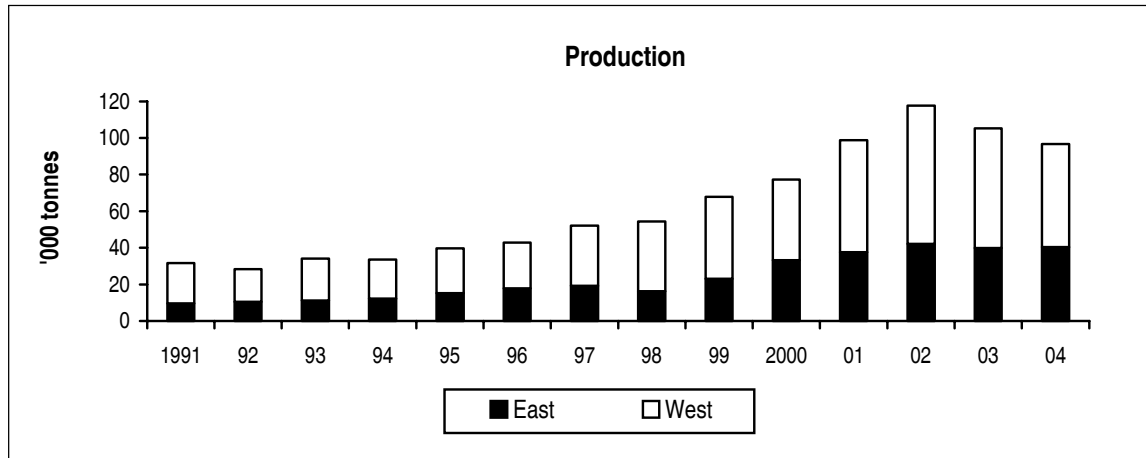
1. Includes fallow sites
2. Dressed, Head-on weight equivalents
3. Includes a small amount of steelhead

Source: Estimates based on discussions with industry and government, Lanteigne (2002), Stewart (2001), GSGislason & Associates Ltd. (2004), and Statistics Canada (2005).

## 2.2 Production, Sales & Exports

Exhibit 2 provides a profile of the industry in 2004.

**Production.** Production of farmed salmon in Canada was 96,600 tonnes in 2004, three times the 1991 level but 20% less than the peak production in 2002 (Dressed Head-on weight equivalents).



New Brunswick comprised 35,000 tonnes or over 85% of the East Coast industry total of 40,300 tonnes in 2004 (Nova Scotia and Newfoundland had 2,000 tonnes and 3,300 tonnes respectively). All the West Coast production of 56,300 tonnes comes from British Columbia.

Price declines since 2000 created forced selling situations, reduction in inventory in the water, reductions on smolt placements etc. In addition, disease and parasite problems – ISA on the East Coast and IHN and Kudoa on the West Coast – reduced production levels. The result was a focus on short term cash flow and economic survival.

**Major Companies.** There was a major consolidation of salmon farming operations on both coasts in 2005. In BC, Marine Harvest acquired Stolt Seafarms and Mainstream acquired Heritage Salmon. In New Brunswick, Cooke Aquaculture acquired the NB operations of both Stolt and Heritage. Today the major companies are:

### East Coast

Admiral  
Aqua Fish  
Barry Group  
Cooke Aquaculture

### West Coast

Creative Salmon  
Grieg Seafood  
Mainstream  
Marine Harvest  
Pan Fish\*  
Target Marine

\* Pan Fish recently purchased Marine Harvest

Cooke, Aqua Fish and Admiral operate in both New Brunswick and Nova Scotia. The Barry Group is a recent venture in Newfoundland. Cooke Aquaculture comprises well over half the East Coast industry in terms of production. All the East Coast companies listed are Canadian-owned.

Marine Harvest, Mainstream and Pan Fish comprise approximately 80% of the BC industry. (In March 2006 Pan Fish purchased Marine Harvest). Mainstream and Pan Fish as well as Grieg have Norwegian parent companies – these companies grow salmon all over the world e.g., Norway, Chile, Scotland, Faroe Islands. Target Marine is Canadian-owned. Creative Salmon, a smaller company, produces only chinook salmon and has some Japanese ownership.

**Sales and Exports.** Farmed salmon sales at the wholesale level were \$544 million CDN in 2004 with 72% of sales going to export markets (Exhibit 2).

Over 95% of export sales go to the US, primarily in fresh whole form although some value-added fillets, portions etc. are sold as well (see Exhibit B.3, Appendix B). Canada is the dominant supplier of fresh whole farmed salmon to the US market.

### 2.3 East vs West Differences

There are significant differences between East Coast and West Coast operations in Canada.

**Climate.** The East Coast suffers from cold winter temperatures exacerbated by very large tidal fluctuations. This can lead to sea water temperatures below zero (“superchill”), which can lead to fish kills. Low winter temperatures cause drops in feeding rates, and thus the production time to harvest size is longer. Harvest size can be lower on the East Coast as well. The climate in BC is ideal for salmon farming

**Species Mix.** The East Coast produces almost exclusively Atlantic salmon (a small amount of steelhead is produced in Newfoundland). BC produces chinook, coho, steelhead as well as Atlantics –chinook and coho are species indigenous to the northern Pacific Ocean.

**Genetic Stocks.** East Coast farmers must use local (St. John River) stocks of Atlantic salmon, which in some generations have not performed well. BC has brought in genetic material from the East Coast, Scotland, Ireland and most recently Iceland (the latter from land-based broodstock programs). The most popular stock is the Mowi stock- originally brought in from the Fanad Hatchery in Ireland. The Mowi stock is characterized by fast growth and late maturation.

**Infrastructure.** Most East Coast processing plants are located inland, making it necessary to transport harvest fish by truck from a dock. This has led to a cumbersome and inefficient process of killing the fish and transporting the fish to the plant. In BC most plants processing farmed salmon are situated on the water, and some have holding pens where large, modern well-boats can off-load the fish at any time of night and day. This enables the plant to maximize plant capacity without staff overtime. Most processing plants in BC also have a higher capacity than East Coast ones.

Feed deliveries in BC are almost always made by barges that supply the feed in bulk (1-2 tonne bags). Centralized, computer-controlled feeding systems have been the norm in BC for a long time, and have been adopted more frequently on the East Coast in recent years.

**Fish Health.** East Coast farmers in New Brunswick have an on-going problem with Infectious Salmon Anaemia (ISA), a viral disease that is difficult to control or eradicate. Farms in New Brunswick are concentrated in the Bay of Fundy region and are much closer together than BC farms, a factor contributing to ISA disease issues. BC farmers have seen two periods with high losses to

Infectious Haematopoietic Necrosis (IHN) virus. This disease has only caused losses in Atlantic salmon on BC farms, but it has killed juvenile wild salmon as well, particularly sockeye salmon (some BC farmers have occasionally converted to farming chinook, a species not affected by IHN).

*Kudoa Thyrsites* (“Kudoa”) is a parasite that attacks the muscle tissue of the fish host and results in soft tissue that reduces their market acceptance. BC farmers had a significant Kudoa problem several years ago, but have not experienced problems lately. East Coast producers have not had Kudoa issues, but have experienced “soft flesh” issues from other causes at certain times of the year.

**Ownership/Financing.** After the recent restructuring, well over half of the East Coast industry is owned by one Canadian company, Cooke Aquaculture. Further consolidation could occur as some East Coast companies appear financially fragile. The main BC companies comprise part of international salmon farming enterprises – they are financially stable, after a period of restructuring. They would have the resources necessary to grow the business, should the conditions (political, regulatory, market) be deemed supportive. Pan Fish and Mainstream are the two largest salmon farming companies in the world.

**Licensing/Governance.** Provincial/local governments on the East Coast have historically been very supportive of aquaculture development. The federal ACOA program has also provided much financial support to the sector, whereas the federal counterpart in BC, Western Diversification, has been much less active in aquaculture. Recent developments in BC have put the previously supportive provincial government into a wait-and-see mode, with yet another review initiative announced recently (the Special Committee on Sustainable Aquaculture).

On-going assaults from ENGOs in the region keep the BC industry from reaching its full potential due to the resulting lack of political support. In addition, First Nations issues are much more visible in BC than on the East Coast. The requirement for consultations with First Nations on licensing issues, as a result of recent court decisions, has impeded the timely issuance/reissuance of tenures.

## 2.4 Industry Associations

The BC Salmon Farmers Association (BCSFA) and the New Brunswick Salmon Growers Association (NBSGA) represent the interests of salmon farming companies in British Columbia and New Brunswick respectively, the two largest salmon production areas in Canada. Nova Scotia and Newfoundland salmon farming companies are represented by a broad-based (finfish and shellfish) aquaculture association in each province.

All these associations are members of the Canadian Aquaculture Industry Alliance (CAIA), a national association based in Ottawa. Some of the larger salmon farming companies in Canada also belong to the relatively new organization Salmon of the Americas (SOTA) based in Miami, which is also supported by Chilean and some US-based companies.

The BCSFA developed a Code of Practice for its members which has led to a high level of competence among farm workers, a better understanding of the regulatory regime, and increasing compliance with provincial regulations. The NBSGA prepared the Atlantic Canada Salmon Farming Sustainability Plan as a major participant in the Federal/Provincial Task Force on Fostering a Sustainable Salmon Farming Industry in Atlantic Canada.



## 3.0 Benchmarks for Competitiveness

The Terms of Reference for this study asked that we benchmark the performance of the Canadian industry – both structurally and in the US marketplace – against one or more major competitors.

For this study we chose to benchmark Canadian performance against that of Norway and Chile, the two largest farmed salmon producing nations in the world. Chile is the dominant supplier of farmed salmon to the US market.

### 3.1 What is Benchmarking?

**Definition.** Benchmarking is a management technique or tool that compares performance among organizations or business activities undertaking similar processes. Benchmarking provides a standard against which industry performance can be measured or judged.

Benchmarking asks and answers questions such as: Who is the best? Who sets the standards? Where do our competitors stand? Benchmarking provides a tool to compare your operation to the results – production and financial – of the industry at large.

The intent is to identify gaps in performance to be bridged by improvements. In essence, benchmarking provides the ability to learn from others and to adopt “best practices”. In today’s increasing competitive environment, with the onslaught of globalization, benchmarking is an invaluable tool for continuous improvements.

**Benchmarking for this Study.** Proper benchmarking requires a thorough knowledge of one’s own industry before a comparison can be made to competitors. Unfortunately, existing profile information on the Canadian farmed salmon industry is incomplete, inconsistent across regions, and/or misleading. In a real sense, it is premature to benchmark the Canadian industry.

Nevertheless, we made a concerted effort to address information gaps for the Canadian industry as well as to profile the Norwegian and Chilean industries. This required a substantial interview program and secondary data collection process. But we did not conduct formal detailed financial surveys of the Canadian companies, for example in cooperation with an accounting firm, as this was beyond our Terms of Reference, project scope and time and budget parameters.

The results of our benchmarking investigations are summarized in Exhibit 3 and discussed in the remainder of this section under five (5) major headings:

- biophysical capability,
- regulatory environment,
- operations,
- input costs & financing, and
- US market penetration

The subsequent discussion focuses on the key benchmark elements. The results should be viewed as preliminary, a foundation upon which to build more extensive work in the future.

### Exhibit 3: Benchmark Elements for Competitiveness – Farmed Salmon

The competitive position of the Canadian, Norwegian and Chilean farmed salmon industries in terms of each of the following attributes is ranked on a score of 1 to 5 where 1 means very non-competitive and 5 mean very competitive, a score of 3 is neutral (higher scores mean less of an issue or cost than lower scores).

	Competitiveness Score			Comment
	Canada	Norway	Chile	
<b>Biophysical</b>				
1. Biophysical capability	4	2	2	CDN West Coast has huge potential, Chile has to move to next region
2. Invasive species/predation	3	4	3	No major differences – few seals in Norway
<b>Government Policy</b>				
3. Site applications/renewals	1	5	3	FN consultation major issue in BC, Norway & Chile don't require renewal
4. Compliance for operating sites	3	3	3	Similar regulations, Chile's based on CDN regulations
5. Introduction & transfers	2	5	4	Norway & Chile have access to premium stocks
6. Processing, inspection	3	4	4	CDN lacks GMO standards on feed
7. Trade issues - tariff	5	2	4	High Norwegian tariff on DR HD/ON product into US
8. - non-tariff	4	3	4	Canada & Chile have FTA with US, Norway does not
9. Animal welfare inc. research	3	2	4	Increasing importance – Norway will be 1 <sup>st</sup> to implement
10. Incentives, subsidies, R&D	3	5	4	Norway enjoys good gov't support
11. Indigenous people consultations	1	4	4	Bottleneck for new site approvals and renewals in BC
<b>Operations</b>				
12. Genetics	3	5	4	CDN BC (Mowi) stock reasonable, narrow St. John River stocks in East
13. Mortality up to harvest	3	4	1	Chile has SRS problems
14. Time to harvest – actual vs optimal	4	4	5	East Coast CDN & Northern Norway slow growing regions
15. Logistics/transportation	4	5	3	Good infrastructure in Norway
16. Access to skilled workers	4	5	2	Chile – problems in finding middle managers, but good plant workers
17. Access to services	4	5	4	Norway has longer history – many service providers
18. Management capability	5	5	5	Good upper management
19. Harvesting processes	3	4	4	Similar processes, East Coast CDN lags behind West Coast
20. Processing processes	3	5	5	Inefficient CDN East Coast plants
21. Continuity of supply	3	4	4	Economy of scale protects Norway & Chile
<b>Input Costs &amp; Financing</b>				
22. Smolts	2	3	5	Chile has cheap lake smolt production
23. Feed	3	2	5	Chile close to fish meal production
24. Transport - farm to plant	3	5	3	Long transport distance in Chile
25. - plant to US market	5	3	2	Big CDN advantage for fresh product, air freight for others
26. Direct Labour - farm site	2	4	5	Low wages in Chile, single shifts & automation in Norway
27. - processing	3	4	5	Skilled workers in Chile, automation in Norway
28. Crop insurance	2	4	3	Few companies offering insurance in Canada (BC)
29. Other operating	4	3	3	Norway can't dead haul fish, poor services in Southern Chile
30. Access to capital	4	5	3	Norwegian banks willing to finance – good economy in BC
31. Cost of capital	3	3	3	Interest rates similar
<b>US Markets</b>				
32. Pricing	4	4	3	CDN fresh advantage, Norway earns premium based on reputation
33. Quality	4	3	3	CDN fresh premium, West Coast still has Kudoa issue perception
34. Nutrition	3	3	3	Similar product attributes
35. Value e.g., taste, form, shelf life	5	4	4	CDN better shelf life, Chile wider product range
36. Packaging & preservation e.g., MAP	3	3	3	MAP of increasing interest to Chile
37. Food safety & traceability	3	3	3	Equal attention, Int'l consulting & technology
38. Process e.g., sustainability	3	4	3	CDN West Coast (& now Chile) subject to heavy ENGO scrutiny
39. Promotion & advertising	2	5	1	Some CDN companies doing brand promotion
40. Marketing approaches e.g, Boards	1	5	3	Norway has advantage in generic marketing

### 3.2 Benchmarks – Biophysical Capability/Growing Conditions

**Biophysical Capability.** The coastline of BC alone at 27,200 km is similar to that of Norway and much longer than that of Chile (much of the Chilean coast is not suitable for salmon farming due to the lack of protected waters).

The Norwegian coast (59-71°N) is unusually warm due to the Gulf Current that comes up from the Gulf of Mexico and helps keep temperatures moderate in the winter. Likewise, the Humboldt Current, originating near the Antarctic Peninsula, keeps the sea water along the southern coast of Chile (41-55°S) at a moderate and suitable level throughout the year (seldom over 15°C in the summer). These conditions, like those in BC (48-55°N) are close to ideal for salmon production.

A report from the late 1990s suggested that British Columbia has the biophysical capability to expand farmed salmon production five-fold or more to 200,000 + tonnes annually (Coopers & Lybrand 1997) – and production since that time has doubled so there is still significant potential for further expansion. A high percentage of coastline on the West Coast of Vancouver Island, North Vancouver Island/Broughton Archipelago, Central Coast and North Coast meet good aquaculture siting criteria for both shellfish and finfish.

The South Coast Bay D’Espoir area of Newfoundland also has substantial potential for salmon farming (the water in the area does not freeze in winter) – it has been suggested that Newfoundland has the biophysical capability to produce 25,000 + tonnes of farmed salmon annually. In contrast, there is much more limited potential for growth in New Brunswick and Nova Scotia, the former because existing Bay of Fundy development is near maximum and the latter because of competing resource user conflicts e.g., commercial fishing on the Southwest.

Chile and BC have had incidents of serious fish losses due to plankton blooms. While losses have occurred in Norway and on the East Coast of Canada, they have not had as severe an impact as in BC and in Chile.

**Invasive Species/Predation.** None of the three countries have had serious problems with invasive species and/or predation. Predation by marine mammals has been more of a problem in Canada and Chile than in Norway, but protective measures taken, such as stronger nets and predator netting, have been effective (Norwegian and Canadian farmers are allowed to kill seals that damage farmed fish).

All three countries have on-going problems with viral diseases- ISA in Norway and New Brunswick, IPN in Norway and Chile, and IHN in BC. Chile also has high rates of mortality due to *Rickettsia*, a bacterial disease without an effective vaccine. Until recently, Norway has considered ISA as an exotic disease to be controlled by eradication. Under a new policy, the development of a vaccine is expected to gain renewed attention. In BC a new, DNA-based vaccine against IHN is being tried in a large field experiment. Canada has recently introduced a National Aquatic Animal Health Program (NAAHP) that incorporates the on-going monitoring of both farmed and wild fish species. This is anticipated to lead to the classification and quantification of fish pathogens in wild species in advance of these pathogens affecting farmed species.

### 3.3 Benchmarks – Government Policy and Regulations

Exhibit 4 summarizes government policy and regulations affecting the farmed salmon industry in Canada, Norway and Chile.

**Governance.** The aquaculture industry in **Canada** is regulated by both the Federal Government and the Provinces, with literally dozens of different regulations in place – the BC aquaculture industry, for example, is subject to 52 separate federal and provincial statutes, regulations, policies and guidelines as well as numerous municipal and regional land use and development regulatory processes (GSGislason, SWOT, 2004). The relationships between the Federal Government and the Provinces are regulated through a series of Memorandum of Understanding or MOUs. The two levels of government are working to clarify roles and renew governance approaches under a series of Aquaculture Framework Agreements (AFAs).

It is anticipated that these AFAs will go a long way towards harmonizing the regulatory regimes for aquaculture between the Federal and Provincial governments, and thereby will streamline the decision-making process between the two levels of government (many observers view the lack of harmonized regulations between federal and provincial governments as the single greatest impediment to industry development). While it is envisioned that these AFAs will be established based on a set of national criteria, there will be regional differences.

The main Federal Department dealing with aquaculture in Canada is the Department of Fisheries and Oceans (DFO) through the administration of the *Fisheries Act* and the *Canadian Environmental Assessment Act*. These are acts of general application and none of these acts have specific mention of aquaculture. DFO also conducts research in order to develop science-based regulations and management regimes. There is a difference between the way federal regulations and policy are administered among the different provinces (although our interviews suggested that the gap has narrowed over the past 2 years as DFO in Eastern Canada has taken a much greater interest in aquaculture).

The Department of Transport (Transport Canada) is required to issue permits for fish farms under the *Navigable Waters Protection Act*, which triggers the need for an environmental assessment under the *Canadian Environmental Assessment Act* (CEAA). The CEAA process for fish farms is undertaken by a Transport Canada screening under CEAA with DFO advice. This also requires consultation with the aboriginal communities in the vicinity of the fish farm. This has led to a virtual stand-still of site applications and renewals in BC as there seems to be no federal guidelines or directives regarding the extent of First Nations consultation required.

DFO also regulates the importation and transport of live fish and genetic material, and is responsible in general terms for fish health issues under the Introduction and Transfers Code. The newly established National Aquatic Animal Health Program (NAAHP) is also designed to provide additional protection of aquatic animals against the harmful effects of diseases. The Canadian Food Inspection Agency (CFIA) is responsible for the management and regulation of processing and packing plants under the *Fish Inspection Act* and the *Consumer Packaging and Labelling Act*. The CFIA has not yet approved the use of ozonated water as a seafood treatment mechanism – many other countries such as US have approved the use of ozonated water.

## Exhibit 4: Comparison of Aquaculture Regulations – Farmed Salmon

	Canada	Norway	Chile
<b>A. Governance</b>			
i) Level of government	<ul style="list-style-type: none"> <li>– regulated by federal &amp; provincial gov'ts</li> <li>– Regional Districts in BC have influence through zoning</li> </ul>	<ul style="list-style-type: none"> <li>– regulated mainly through 3 federal gov't departments</li> </ul>	<ul style="list-style-type: none"> <li>– regulated by federal gov't</li> </ul>
ii) Regulations	<ul style="list-style-type: none"> <li>– DFO administers Fisheries Act</li> <li>– Transport Canada issues permits under Navigable Waters Protection Act which normally triggers CEAA</li> <li>– CEAA requirement for consultations with indigenous peoples</li> <li>– prov regulations &amp; interpretation of federal regulations can vary between provinces</li> </ul>	<ul style="list-style-type: none"> <li>– Fisheries Dept. regulates the establishment and farm operations, product quality</li> <li>– Agriculture regulates the prevention and management of fish diseases, feed and feed ingredients</li> <li>– Environment regulates waste and impact monitoring</li> </ul>	<ul style="list-style-type: none"> <li>– Ministry of Economy, Development and Reconstruction and its Undersecretariat of Fisheries regulates the establishment, management and environmental conditions of farms</li> <li>– National Fisheries Service in charge of enforcement</li> </ul>
iii) Endangered species legislation	<ul style="list-style-type: none"> <li>– potentially applicable</li> </ul>	<ul style="list-style-type: none"> <li>– not applicable</li> </ul>	<ul style="list-style-type: none"> <li>– not applicable</li> </ul>
<b>B. Siting</b>			
i) Farm separation	<ul style="list-style-type: none"> <li>– 3 km in BC (farms from same company can be 1 km apart), 300 m in NB</li> </ul>	<ul style="list-style-type: none"> <li>– variable</li> </ul>	<ul style="list-style-type: none"> <li>– 2778/400 m (new farms 2004)</li> </ul>
ii) Annual licence/tenure	<ul style="list-style-type: none"> <li>– annual licences/tenures issued for 5-25 years</li> </ul>	<ul style="list-style-type: none"> <li>– none</li> </ul>	<ul style="list-style-type: none"> <li>– none</li> </ul>
iii) Fish density limit	<ul style="list-style-type: none"> <li>– none</li> </ul>	<ul style="list-style-type: none"> <li>– 25kg/m<sup>3</sup> pen volume</li> </ul>	<ul style="list-style-type: none"> <li>– none</li> </ul>
iv) Annual rent	<ul style="list-style-type: none"> <li>– 3700-8900 US\$/ yr</li> </ul>	<ul style="list-style-type: none"> <li>– 0</li> </ul>	<ul style="list-style-type: none"> <li>– 107-170 US\$/ha/yr</li> </ul>
<b>C. Fish Health</b>			
i) Disease monitoring, record keeping, reporting	<ul style="list-style-type: none"> <li>– a requirement</li> <li>– NAAHP calls for routine monitoring of both wild &amp; farmed fish</li> </ul>	<ul style="list-style-type: none"> <li>– a requirement</li> </ul>	<ul style="list-style-type: none"> <li>– a requirement</li> </ul>
ii) Veterinary services	<ul style="list-style-type: none"> <li>– Fish Health Management Plans (FHMP), veterinary used as required</li> </ul>	<ul style="list-style-type: none"> <li>– requires routine visit by veterinarian</li> </ul>	<ul style="list-style-type: none"> <li>– New reg's. in place?</li> </ul>
iii) Separation of generations	<ul style="list-style-type: none"> <li>– BC practices generation/legal separation requirement in NB</li> </ul>	<ul style="list-style-type: none"> <li>– legal requirement</li> </ul>	<ul style="list-style-type: none"> <li>– no legal requirement</li> </ul>
iv) Bleeding fish at farm site	<ul style="list-style-type: none"> <li>– permitted</li> </ul>	<ul style="list-style-type: none"> <li>– not permitted</li> </ul>	<ul style="list-style-type: none"> <li>– permitted</li> </ul>
v) Restrictions on genetic stocks	<ul style="list-style-type: none"> <li>– East coast farmers must use local (St. John River) stocks</li> </ul>	<ul style="list-style-type: none"> <li>– Few- access to all Premium stocks</li> </ul>	<ul style="list-style-type: none"> <li>– few</li> </ul>
<b>D. Waste Management</b>			
i) Environmental monitoring of operations	<ul style="list-style-type: none"> <li>– required</li> <li>– detailed initial monitoring required</li> </ul>	<ul style="list-style-type: none"> <li>– required</li> <li>– initial monitoring similar to the Scottish DEPOMOD*/ ongoing monitoring dependent on level of impact</li> </ul>	<ul style="list-style-type: none"> <li>– required</li> <li>– Initial monitoring required</li> </ul>
ii) Baseline site monitoring e.g., benthic, chemicals etc.	<ul style="list-style-type: none"> <li>– required</li> </ul>	<ul style="list-style-type: none"> <li>– limited</li> </ul>	<ul style="list-style-type: none"> <li>– required</li> </ul>
iii) Sea lice monitoring	<ul style="list-style-type: none"> <li>– required in BC</li> </ul>	<ul style="list-style-type: none"> <li>– required</li> </ul>	<ul style="list-style-type: none"> <li>– not required</li> </ul>
<b>E. Escapement Prevention</b>			
i) Reporting of escapes	<ul style="list-style-type: none"> <li>– required in BC (inc. suspected escapes)</li> </ul>	<ul style="list-style-type: none"> <li>– required (inc. suspected escapes)</li> </ul>	<ul style="list-style-type: none"> <li>– required (inc. suspected escapes)</li> </ul>
ii) Prohibitions on escapes	<ul style="list-style-type: none"> <li>– yes</li> </ul>	<ul style="list-style-type: none"> <li>– yes</li> </ul>	<ul style="list-style-type: none"> <li>– yes</li> </ul>
iii) Minimum net strength standards	<ul style="list-style-type: none"> <li>– yes</li> </ul>	<ul style="list-style-type: none"> <li>– yes</li> </ul>	<ul style="list-style-type: none"> <li>– no</li> </ul>

\* DEPOMOD - DEPOsitional MODelling (computer model of deposition patterns)

Provinces have responsibility for land use, education, resource management and environmental monitoring. The Provinces issue land tenures and are responsible for environmental issues such as waste management.

The farmed salmon industry in **Norway** is regulated through three federal government departments:

- Fisheries – regulates the establishment and operation of farms, as well as product quality
- Agriculture – regulates the prevention and management of fish disease, feed and feed ingredients
- Environment – regulates waste and environmental monitoring

The aquaculture industry in **Chile** is mainly regulated by the federal Ministry of Economy, Development and Reconstruction (MEDR) and the Undersecretariat of Fisheries. The Undersecretariat is responsible for policy making and the drafting of laws and regulations. The National Fisheries Service is responsible for enforcement and data base compilations.

The main laws dealing with aquaculture in Chile are:

- *General Law of Fisheries and Aquaculture*, which regulates issues like environmental conditions around salmon farms, information about aquaculture and aquaculture licencing
- *Law of the Environment*, which is the main law about the environment in Chile. It sets standards for Environmental Impact Assessments, allowable production levels at farms, discharge limitations and pollution prevention requirements.

A National Aquaculture Registry is maintained in Chile, with information about: 1) Licence Holders (identity, address), 2) Number of licences held, 3) Location of farms with surface and geographical description (coordinates), and 4) List of licenced species and authorized installations.

In conclusion, Norway and Chile have a streamlined “single window” federal regulatory process for aquaculture which gives these two countries a substantial competitive advantage over Canada. Canadian CEOs spend a lot of time and energy on regulatory issues to the detriment of other pressing matters. As one CEO said to us:

*... we want a stable, even playing field that we can understand.*

The ongoing Aquaculture Framework Agreement discussions in Canada offer the promise of harmonization and streamlining of regulations. The Smart Regulations initiatives of the federal Privy Council office offer the hope of performance-based regulation, not micro-management, and a better, faster, cheaper regulatory system. However, industry is wary that government may just want to download costs.

**Siting.** Norway and Chile do not require licence/tenure renewal i.e., there is no time limit on licences. BC requires an annual renewal of aquaculture licences while tenures are usually issued for a 5-25 year period. First Nations consultations are a key part of the CEAA application/renewal process in Canada, especially BC.

Norway has a NOK 5 million Concession Fee (about \$800,000 US) and a NOK 12,000 (about \$2,000 US) application fee for a new licence – Chile has neither. Canadian companies can spend \$75,000-

125,000 US on Environmental Assessments for an application to one site, and review of such assessments can take 2 to 5 years under the current management of laws and regulations.

The annual rent fee in Norway is zero, in Chile is 107-170 \$US/ha, and in BC is 3,700-8,900 \$US/yr per site.

Norway has a Fish Density Limit of 25kg/m<sup>3</sup> of pen volume – there is no set limit in Chile or Canada.

Farm separation requirements are:

- 3km in BC (1km for inter-company sites/300 m in New Brunswick),
- 308 m in Chile, and
- variable in Norway.

Each salmon farming licence in Norway covers the use of three locations or sites, enabling the following of each individual site for a year or more between stocking. There are approximately 2,400 registered sites for salmon farming in Norway.

Norway has establishment, operation, and disease preventive measures for smolt farms e.g., maximum of 2.5 million smolts per site, minimum of 0.3 litres water/kg fish/minute.

**Fish Health.** The three countries all have disease monitoring, record keeping and reporting requirements. Bleeding of fish is not permitted at the farm site in Norway due to the policy of eradicating known diseases like ISA, which may be spread inadvertently by the discharge of untreated blood water – Canada and Chile have no such restrictions as they consider all known diseases as endemic, allowing the less costly transportation of bled fish in Refrigerated Sea Water (RSW). In Canada, however, blood water is usually discharged to the processing facility where the water can be treated as part of a company's Fish Health Management Plan (FHMP).

Norway has both private and public veterinary services, Canada (BC) has mostly private vets, whereas Chile has almost exclusively private vets. Norway requires routine visits by veterinarians whereas BC is governed by Fish Health Management Plans (FHMP) with vets used as required. Norway, Chile and New Brunswick have eradication policies for diseases like ISA.

Norway has a legal requirement for generation separation, Chile does not. Canada (BC) practices separation, but it is not a legal requirement (usually specified in a company's FHMP). New Brunswick also practices separation.

**Environmental Issues.** All three countries require environmental monitoring. Norway and Canada, both Eastern Canada and BC, require sea lice monitoring but Chile does not. Norway, Chile and BC require reporting of escapes (but Eastern Canada does not).

All three countries regulate waste from salmon farming operations. Chile prohibits anaerobic conditions under farm sites – when such conditions do occur, the operator must adjust the production volume. Norway requires a waste permit. Canada has various forms of performance-based standards, meaning that a farm can have a maximum level of impact (usually based on a set of chemical parameters) under or near the farm. It is up to the farmer to manage the level of production, and therefore feed usage, to conform with these standards. BC is currently finalizing its provincial Aquaculture Waste Management Regulations.

All countries prohibit the escape of farmed salmon, and Canada and Norway have imposed minimum net strength standards that call for stronger nets for use in larger cages. There are no restrictions on cage size or number of fish per cage outside the maximum density requirements as stated above.

BC's producers of Atlantic salmon have an advantage within serious scientific circles over Norway and the East Coast of Canada since their progeny can not produce viable off-springs from mating with local, Pacific salmon. The industry has so far not been able to capitalize on this advantage.

**Trade Issues.** Imports of whole (Dressed Head-on) Norwegian Atlantic salmon into the US have been subject to a 26.7% tariff since the early 1990s. In the late 1990s Chilean imports of Atlantic salmon, all forms, were hit with a much smaller tariff of under 10%, a tariff since removed. There are no tariffs on Canadian farmed salmon products.

Canada and Chile have Free Trade Agreements with the US. Norway does not. These free trade agreements put Chile and Canada on an even footing in their competition for market share in the US from a market access point of view. Chile has also been aggressively pursuing free trade agreements for seafood with the European Union and Japan.

### 3.4 Benchmarks – Operations

Exhibit 5 summarizes benchmarks for operations in the three countries.

**Genetic Stock.** BC uses primarily the good performing Mowi stock but Eastern Canada is restricted to the single St. John River stock due to the concern of genetic dilution of wild Atlantic salmon from escaped farm fish of “exotic” origin. BC has only one advanced breeding program, a program owned by Mainstream. Norway and Chile have access to premium stocks from a number of sophisticated fish breeding programs (with Chile always being one generation behind Norway when using imported eggs from Norway).

**Mortality Up to Harvest.** All three countries typically use the 10% mortality rate benchmark. Norway usually performs better than this and Chile is worse. Farm mortality is higher in Chile in part because lake rearing of smolts fosters vulnerability to disease. (Chile has no effective vaccine against the bacterial disease *Rickettsia* (SRS) although much research is underway to rectify this). Canadian mortality rates are in the middle at 5-15% with BC farms having lower rates on average than New Brunswick farms.

**Logistics/Transportation and Services.** There is good infrastructure in Norway e.g., road, ferry and communication systems. Chilean farms are located far from Santiago from where most of the product is shipped to export markets (most processing occurs also a fair distance from the new production sites).

**Access to Skilled Workers.** Chile has problems finding good middle-level workers (site managers etc.) but has good plant workers. Fish farming is a respected industry in Norway and attracts well-qualified individuals planning to make a career of the industry. BC has experienced recruitment and retention problems both on farm sites and in plants e.g., primarily single men in early 20s on farm sites with much turnover, an experienced well-respected plant manager in BC recently took a job in Australia (where the industry is growing and the government is supportive of growth).



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## Exhibit 5: Operation Benchmarks – Farmed Atlantic Salmon

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	Canada	Norway	Chile
<b>Characteristics</b>			
Typical New Farm Site - ha per site	25	12	unknown***
- tonnes per site*	2,500 BC/1,500 EC	~1,200	unknown***
Genetic Stock	Mowi/St. John	multiple	multiple
Typical Smolt Size	80-100 g	50-80 g	80-100 g
% Smolts Lake Reared	<10%	<5%	~ 90%
Growout Period**	16-28 months	14-18 months	16-20 months
Typical Harvest Size	4-7 kg	4-5 kg	4-5 kg
Farm Mortality - target	10%	10%	10%
- actual	5-15%	5-10%	15-20%
Harvest Techniques	increasingly percussion	chilling/CO <sub>2</sub>	increasingly percussion
Live Haul or Dead Haul to Plant?	live & dead haul	all live haul	live & dead haul
Farm Workers Live in Camp?	yes for WC/ no for EC	no	yes
Filleting Techniques	hand & machine	machine	hand
Pinbone Removal for Fillets	post rigor - machine	post rigor - machine	pre rigor-hand

\* production per generation, not annual production

\*\* large regional differences exist

\*\*\* new performance-based regulations yet to be tested in real life situations

**Farm Site Operations.** In BC, almost all farm sites are located on remote locations necessitating the operation of camps with workforce rotations. In Norway and New Brunswick, a salmon farming job is usually like any other typical Monday to Friday 8 hour a day job where the worker returns home each night i.e., the farm sites are adjacent to population centres. The farm site in Norway is left unattended on weekends with fish fed using automated feeding systems. Chilean farms also operate a camp with workforce rotation.

**Harvesting Processes.** The trend in BC is to stun and bleed at the farm site but this requires delivery to the plant and processing within 20-24 hours before rigor sets in. Dead hauling to the plant is cheaper and the fish is better quality so long as it is slaughtered gently. Norway can not dead haul fish by regulation. In Chile and with increasing frequency in Norway, processing plants are often long distances from the farm site making dead hauling of fish problematic. This situation necessitates the use of large live-haul vessels that sometimes can take up to two days to travel from the farm site to the processing plant. This can add to the stress level of the fish, causing a drop in Ph levels and subsequent reduction in quality and shelf life.

**Processing Techniques.** All countries have access to the same processing technology – but you need 4,000 to 5,000 tonnes of plant throughput annually before automated processing equipment is cost effective (some Canadian plants do not meet this threshold). Generally Norwegian and Chilean plants are new and process greater volumes annually than do Canadian plants. New Brunswick plants are situated off the water necessitating inefficient truck transport of fish from the dock to the processing plant.

### 3.5 Benchmarks – Input Costs & Financing

Exhibit 6 presents representative costs of production for fresh whole and fresh fillet Atlantic salmon into the US markets from Canada, Norway, and Chile in 2004. The intent is to convey the essence of the cost structure of US imports from competing sources rather than to estimate precisely the Cost of Production.

<b>2004 Farm Level \$US/kg</b>	
<b>Cost of Production*</b>	
Canada	~2.60
Norway	~ 2.30
Chile	~ 1.85

*\* estimates based on interviews and literature review (costs are before freight, processing, packaging, selling costs & farm-level capital costs).*

The results suggest that:

- Fresh whole – Norway and Chile are not viable suppliers to the US market (Norway because of tariff and high air freight costs, Chile because of high air freight costs)
  - Canada is the only viable supplier of the three
- Fresh fillets – Chile is the most competitive supplier, in spite of high air freight costs, due to much cheaper processing costs (filleting is labour intensive and Chile has cheap labour)
  - Canadian producers receive better returns from selling whole fish rather than fillets to the US market

Following is a discussion of some of the key input cost parameters.

## Exhibit 6: Price and Cost Benchmarks – Farmed Atlantic Salmon

Circa 2004	\$ US per kg		
	Canada	Norway	Chile
<b>A. Fresh Dressed Head-on Product to US</b>			
1. Market Price FOB US	4.25	5.70	3.75
2. Less: Tariff	0	1.20*	0
3. Transport to US	.20	1.30	1.80
4. Harvesting, Processing & Packaging	.85	.70	.60
5. Selling Costs/Other	.20	.20	.20
6. Farm Gate (Transfer) Value	3.00	2.30	1.15
7. Less: Smolts	.50	.30	.20
8. Feed	1.50	1.40	1.20
9. Other Farm Level	.60	.60	.45
10. Net Farm Return	.40	0	(.70)
<b>B. Fresh Fillets Skin-on Product to US</b>			
1. Market Price FOB US	7.25	7.75	6.75
2. Less: Tariff	0	0	0
3. Transport to US	.20	1.30	1.80
4. Harvesting, Processing & Packaging	2.40	2.20	1.40
5. Selling Costs/Other	.35	.40	.35
6. Farm Gate (Transfer) Value	4.30	3.85	3.20
7. Less: Smolts	.75	.45	.30
8. Feed	2.25	2.10	1.80
9. Other Farm Level	.90	.90	.60
10. Net Farm Return	.40	.40	.50

- Note
1. Tariff of 27% on Norwegian whole farmed salmon imports into US (zero tariff on fillets)
  2. Conversion rate from fillets to DR HD/ON of 1.5
  3. Truck transport to US for Canada/air transport to US for others
  4. Net return is farm level capital return available for interest, depreciation and pre-tax profit (processing, transport and selling costs are contract rates i.e., include a normal return to capital)
  5. Canadian figures are a weighted average of East and West Coast figures
  6. "Harvesting, processing & packaging" includes transport to plant
  7. Prices in 2005 increased 10 to 20%
  8. The symbol "( )" denotes negative number

Source: Representative prices and costs derived from industry discussions and several sources:

- Statistics Canada, "Aquaculture Statistics 2004", Cat. No. 23-222-XIE
- ISB Research, "ISB Seafood Industry Reports – South America", December 2005
- Fiskeridirektoratet, "Lønnsomhetsundersøkelse for Matfiskproduksjon Laks og Orret", 2004
- Anderson, James L., "The International Seafood Trade", CRC Press 2004
- Pricewaterhouse Coppers, "A Competitiveness Survey of the British Columbia Salmon Farming Industry", 2003
- Knapp, Gunnar, "Projections of Bristol Bay Salmon Prices", Alaska CFEC, 2004

**Smolt Rearing.** Chile has a substantial advantage in that most of their smolts are lake-reared, a very cheap rearing method (although access to lake rearing will be curtailed in the future). BC has only a few lake rearing locations, New Brunswick has none. Canada has good recirculation systems for hatchery production of smolts, but a relatively high loss rate between the egg and smolt stages. Norway uses heat from industrial installations to warm production water. Chile and Norway both have access to premium stocks from sophisticated breeding programs.

**Feed.** Norway has been slow to replace fish meal and oil components by a vegetable component, but gets good Feed Conversion Ratios (FCRs). Canada has ready access to non-marine ingredients. Chile is close to production facilities in fish meal and oil. Cost of feed in Chile is probably 20 to 30% less than in Canada.

**Wage Rates.** Wage rates in Canada are substantially higher than in Chile but lower than in Norway. Wage rates in New Brunswick on farms and in plants appear to be 15 to 20% less than in BC.



Wage rates in US non-unionized food processing plants would be well under \$20 US per hour. Lower wages in the US can make it attractive for BC companies to ship whole fish to the US where it can be filleted (value-added) at less cost. This fits well with the strategy of transporting dead-hauled fish from the farm to the plant, and processing the fish prior to rigor. By the time these fish reach their US destination, the fish will have come out of rigor, and the pin bone can then be easily extracted.

### 3.6 Benchmarks – US Market Performance

In 2005 Canada exported \$370 US million worth of farmed salmon to the United States. Canada is the dominant supplier to the US of fresh whole farmed salmon with in excess of a 80% market share of US fresh whole imports (Exhibit 7).

<b>2005 US Farmed Salmon Imports \$US million</b>			
	<b>Fresh Whole</b>	<b>Other</b>	<b>Total</b>
Canada	295	75	370
Norway	9	36	45
Chile	9	594	603
Other*	<u>29</u>	<u>27</u>	<u>56</u>
	342	732	1,074

\* Most of the "other" producing region is the United Kingdom

**Customer Trends.** Canadian farmed salmon is one of a variety of protein sources for "centre of the plate", namely: 1) red and white meat protein, 2) other seafood, and 3) other farmed salmon. Today's customer is looking for health benefits, food safety, and convenience as well as the traditional attributes of taste and value. Some specific trends are:

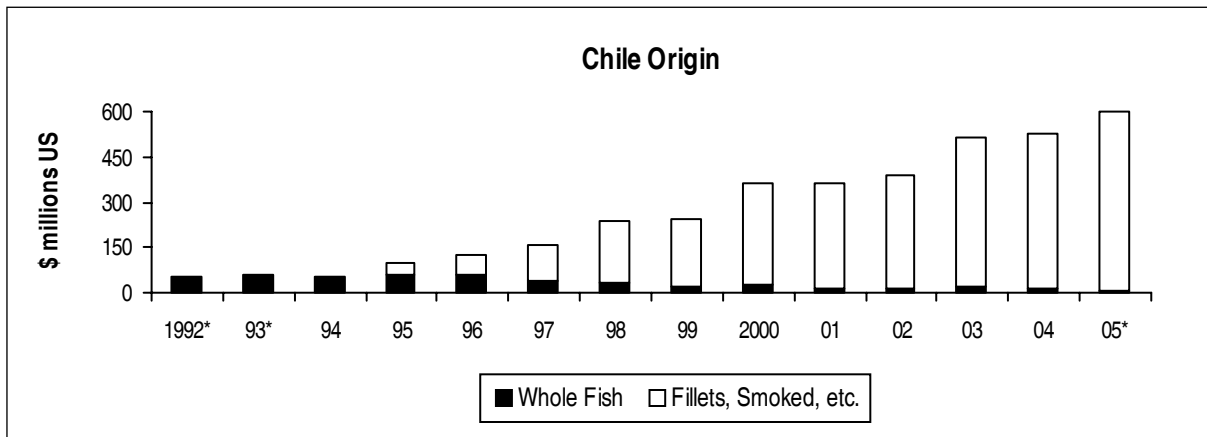
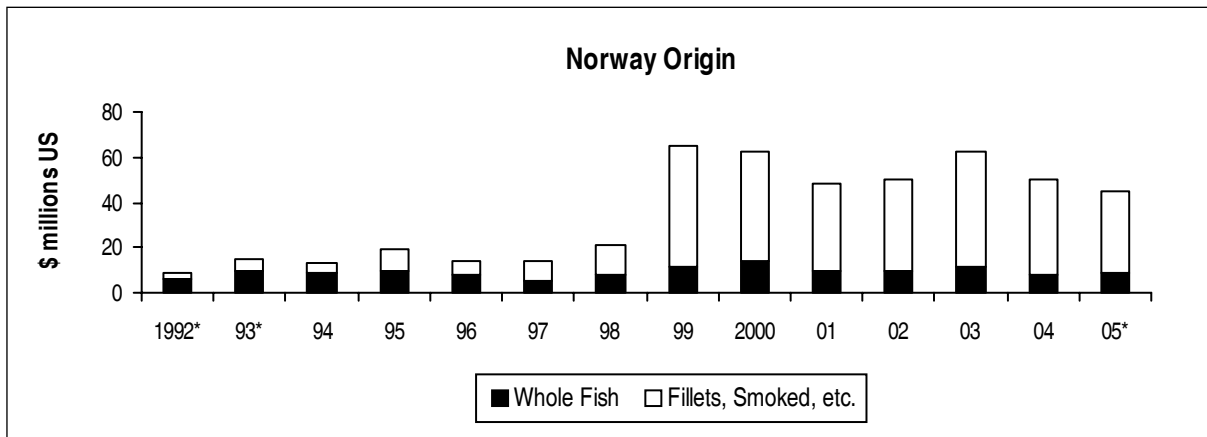
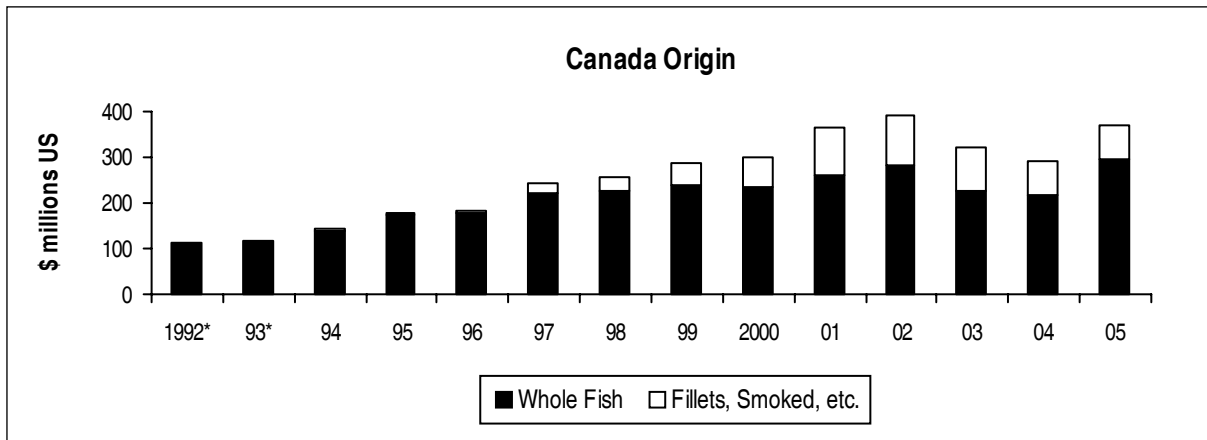
- more convenience, portion control, meal-ready heat & serve items
- increasingly frozen portions and other value-added foodservice (with less trained kitchen staff)
- increasing focus on nutrition and health benefits of seafood e.g., beneficial fish oils such as omega 3
- more people eating out

Farmed salmon is well-positioned to deliver what the consumer wants. As a result, farmed salmon imports to the US have increased dramatically over the past 15 years (see Exhibit 1, Section 1). Farmed salmon is the biggest seller in the fresh seafood counters of retail stores in the US.

**Quality.** The quality of farmed salmon as it leaves the waters of farms in Canada, Chile, and Norway is very good. However, there can be noticeable differences in quality as the product reaches the US market, primarily related to distance. Canada's proximity to the US allows the US customer to receive it within 2-3 days by truck from leaving the farm site.

Much greater distances within Chile, from the farm site to the main Santiago distribution point, and between Chile and the main US transshipment point of Miami means that the Chilean product is 3-4 days older even if air freighted i.e., Canada has a 3-4 day shelf life advantage over Chile. Longer shelf life can translate into better appearance, texture, taste, and less "shrinkage" to the buyer.

## Exhibit 7: US Imports of Farmed Salmon



\* For years 1992 and 1993 split between whole and other fish are estimates.

Source: US National Marine Fisheries Service (Exhibit B.3, Appendix B)

At one time there was a significant difference in food safety and traceability regulations between Canada and Chile. It appears that the gap has essentially disappeared today i.e., there have been significant improvements in the Chilean food regulatory regime. All three countries – Canada, Norway, and Chile – have good food safety programs.

**Fresh vs. Value-Added.** Chile originally produced mainly fresh whole fish for the US market but transformed itself to producing almost exclusively fillets, portions, etc. due to air freight issues, both high costs plus the difficulty of actually getting space i.e., “lift”. There has been high demand in the US for fillets and portions and the demand has fueled the rapid growth of Chilean imports (Exhibit 7).

In the 1990s Canada started to export more value-added fillets and portions as well – but recently has started to retrench somewhat back to fresh whole fish. The reasons are complex, but include:

- wage rates – the lower wages in the US can make it attractive for a BC company to ship whole fish to the US where it can be filleted at less cost.
- rigor considerations – filleting requires removal of pinbones, a process that can't proceed until 24-48 hours after rigor mortis, some companies prefer to ship whole fish to the US where the filleting/pinbone removal can occur immediately upon arrival i.e, you gain 2 days of shelf life.
- customer specifications – cutting the fish close to the market allows for greater flexibility in accommodating specific customer specifications.
- corporate philosophy and vertical integration – some companies with ownership in processing facilities or ties to the retail sector prefer to produce fillets, other companies do not; in addition, the Canadian industry can not meet demand for whole fish now so there is little incentive to expand the value-added portion of the business.
- ozonated water – ozonated water baths which can enhance shelf life by a week or more, are allowed for seafood in the US but not in Canada; some companies prefer to cut fish in the US where the fish can immediately be immersed into an ozonated water bath.

At the same time, retail and foodservice buyers prefer the convenience of fillets (obviating the need for kitchen preparation skills) – several comments received from US buyers bemoan the fact that they could not get more fresh fillets from Canada (see Exhibit 8). The key is to receive a price premium that provides an incentive, i.e., a extra margin, for producing fillets.

**Chile and the US Market.** Up to now Chile has produced primarily fillets – both fresh and frozen – for the US market but fresh fillet shipments are expected to decline due to the rising cost of air freight from increasing oil prices. Over the past year Chile increasingly has looked to Europe as a market for frozen salmon since:

- frozen fish can be shipped by marine freight, a much cheaper transport mode than air freight (by which fresh fish must travel)
- the European Union established relatively high minimum import prices for farmed salmon in 2005 and Chile can export salmon to the EU duty free.
- there is substantial retail and remanufacturing demand for Chilean frozen salmon in Europe

As a result, Chile likely will export less fillets to the US and more frozen fish to Europe in the near future, and what fillets they do export to the US increasingly will be frozen. This represents an opportunity for Canadian suppliers of both fresh whole fish and fresh fillets.

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**Exhibit 8: The US Market for Farmed Salmon – Selected Interview Comments**

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1. “It’s all about perception when it comes to food”.
  2. “There is a climate of excitement around seafood”.
  3. “Farmed salmon is a commodity, a staple and is the biggest seller in the fresh seafood counter”.
  4. “Canadian salmon is preferred for its texture and taste”.
  5. “The West Coast Canadian suppliers can’t seem to supply the D and E trim fillets we want. Fillets and portions are in high demand”.
  6. “The Product of Canada label still has caché”.
  7. “The price for Canadian whole fish is set by the market price for frozen Chilean fillets”.
  8. “The shelf life of Canadian product is better due to proximity to market”.
  9. “Canada gets a 10 to 15% price premium over Chile”.
  10. “California with their migrant labour can cut cheaper than BC”.
  11. “We spend a minimal amount of money marketing our product compared to pork”.
  12. “Most companies have sales offices, not marketers”.
  13. “The Canadian government is focussed on regulating the industry – the Norwegian and Chilean governments are focussed on promoting the industry”.
  14. “Marketing should be done to differentiate Canadian salmon from others. Canada has done nothing to promote the Canadian origin of fish”.
  15. “On the West Coast big retailers such as Fred Meyer, Albertsons and Safeway buy from retail distributors – on the East Coast big retailers buy from salmon companies directly”.
  16. “The Canadian industry needs to provide better communication and information to neutralize extreme factors of the ENGO movement – consumers need to be educated”.
  17. “Sustainability and competitiveness go hand in hand”.
  18. “Nobody can take on the Chileans for frozen in North America”.
  19. “Frozen products are gaining in popularity, can be of excellent quality, although fresh fish still has a reputation of being better. Prepared portions – ready to eat – are emerging. Chile will be producing less fresh product due to the increasing cost of freight as a result of climbing oil prices”.
  20. “BC needs to do a better job with PR, provide point-of-sale material. You need to fight false information, and create stories about the health benefits of eating seafood that is produced in an environmentally sound manner”.
-



**Pricing.** The price of farmed salmon has fallen over the past 10 years with the dramatic increase in world supply (Exhibit I, Section I). Farmed salmon has become a commodity – like protein. The large increase in world supply in the late 1990s and early part of this century caused a dramatic decline in price in the 2000-02 period, an event that caused substantial industry restructuring around the world that continued into 2005. However, prices have increased throughout 2005 and into early 2006.

Today prices for Canadian farmed Atlantic whole fish approach \$5 US/kg and for skin-on fillets D-trim approach \$8.50 US/kg (FOB US market). Presently demand exceeds supply and, as a result, US prices increased by 10-15% in 2005.

<u>\$US per kg</u>	<u>Farmed Atlantic Whole 4.5-5.5 kg per fish</u>	<u>Farmed Atlantic Fillet Skin-on PBO* 1.4-1.8 kg per fish**</u>
Canada - NB	~ 5.30	~ 8.80
- BC	~ 4.85	~ 8.45
Norway*	~ 6.70	NA
Chile	NA	~ 7.50

\* including 27% tariff

\*\* D-trim for Canada, C-trim for Chile

Source: Urner Barry, December 2005

The prices above demonstrate that Canada receives a 10-15% price premium over Chilean product and that Norwegian whole fish, due to the substantial 27% tariff, is priced substantially higher than Canadian fish. The price premium reflects the Canadian quality/shelf life advantage.

**Exchange Rates.** The export price of all three countries have been hurt by stronger currencies since 2002 – but the Chilean peso has strengthened to a greater extent than the Canadian or New Zealand dollar (see Exhibit B.4, Appendix B).

**Marketing Approaches.** Canadian producers have marketed their products individually and, in the case of a BC companies operating in other parts of the world, under the worldwide company name and logo. The Canadian farmed salmon industry on both the East and West Coasts participates in CAIA’s long-term international strategy which receives funding through the AAFC Agriculture and Food International (CAFI) programs.

The Norwegian industry coordinates their marketing through the Norwegian Salmon Export Marketing Council (members pay a levy of 3.3% of value). The Council has been very successful at raising the visibility and promoting the quality of Norwegian salmon worldwide.

Exhibit B.5, Appendix B profiles the Chilean industry and its business environment.

## 4.0 Conclusions & Recommendations

This Benchmarking study has compared the performance of the Canadian farmed salmon industry, both structurally and in the US marketplace, against major competitors of Norway and Chile. Each country does certain things better, and some things worse, than the other two. Our conclusions under each of the five major performance headings are:

- biophysical capability – Canada has as good growing conditions as any place in the world and has the potential to expand production substantially
- government regulations & policy – Norway and Chile with their “single window” federal regulations are well ahead of Canada; the Canadian industry can not reach its potential due to regulatory gridlock
- operations – Norway is generally the strongest with its advanced infrastructure
- input costs – Chile with its cheap smolts, feed and labour is the lowest cost producer in the world (but Chile and Norway incur high air transport costs getting fresh product to the US); the Chilean labour cost advantage is most pronounced in (value-added) fillets and portions
- US market penetration – Canadian product has longer shelf life than Chilean product, and receives a small price premium for this better quality; the Chilean industry can make money at these lower prices due to a substantial cost advantage in fillets; Canada finds producing whole fish more profitable than producing fillets; Norway essentially is excluded from the US whole fish market due to high tariffs

<b>Key Advantages &amp; Disadvantages of Canadian Industry*</b>	
<b>Advantage</b>	<b>Disadvantage</b>
<ol style="list-style-type: none"> <li>1. proximity to US market               <ul style="list-style-type: none"> <li>• high transportation cost advantage on perishable products</li> <li>• farm site to customer within 48-72 hours possible</li> </ul> </li> <li>2. quality of product               <ul style="list-style-type: none"> <li>• greater shelf life</li> <li>• water quality</li> <li>• food safety</li> </ul> </li> <li>3. familiarity with US               <ul style="list-style-type: none"> <li>• direct neighbours</li> <li>• similar language, culture</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>1. cumbersome, inefficient regulations               <ul style="list-style-type: none"> <li>• lack of federal/provincial harmonization</li> <li>• prevents access to new sites, economies of scale</li> <li>• First Nations consultation onerous – no federal rules</li> </ul> </li> <li>2. lack of effective communications               <ul style="list-style-type: none"> <li>• health benefits of seafood</li> <li>• counteract ENGO falsehoods</li> <li>• market Canadian quality</li> <li>• garner political &amp; community support</li> </ul> </li> <li>3. higher input costs               <ul style="list-style-type: none"> <li>• smolts, feed, labour</li> </ul> </li> </ol>
<p><i>* apart from growing conditions</i></p>	

The first two disadvantages, in our opinion, can and should be addressed. It is incumbent on government, with the constructive support of industry, to streamline the regulatory process and reduce the micromanaging of the aquaculture industry i.e., define reasonable performance standards and allow industry to determine the best way to meet and exceed them. Regulatory reform is the gatekeeper to industry viability and growth. There is a saying that "...uncertainty kills any business". Regulatory certainty is a paramount issue for the Canadian farmed salmon industry.

Industry should address the second major disadvantage, the communication challenge. We believe that there is a major opportunity to educate the consumer, the community and the general public as to the health, community development and sustainability benefits of Canadian farmed salmon.

The third is a present "fact of life", but something that may become less significant as lake access for smolt rearing in Chile is restricted, feed formulations change worldwide, and productivity improvements are realized in Canada.

The Canadian advantage is most prominent in the delivery of high quality, gutted whole fish to the US market by truck. This market segment is smaller and more specialized than the fillet market – other nations need to employ expensive air freight to access the US fresh salmon market.

Canada can produce high quality by stunning and bleeding the salmon with low stress at the farm site, dead hauling the fish to the Canadian plant where it is gutted prior to rigor, transporting the gutted whole fish to a US cheap labour facility where the fish, now out of rigor, can be cut into fillets or portions to exact customer requirements. This results in the ultimate freshness and shelf life to the end customer. And this quality advantage can extract a price premium. Canada should be the preferred supplier of fresh whole farmed salmon to the US.

Although producing fresh whole fish is our competitive advantage today, we do not recommend that Canadian industry produce only this product. Some Canadian producers have developed profitable niche markets for fresh fillets, skewers or portions. These markets should continue to be cultivated. Moreover, producing a variety of products reduces market risk – the market is capricious and can change rapidly. Finally, it is important for Canadian industry to maintain supply capability for fresh fillets, particularly if Chile withdraws somewhat from the US market due to high air freight costs. The US fresh fillet market could be much more attractive for Canadian producers in the future than it is today.

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USDA Foreign Agricultural Service GAIN Report, "Canada Fishery Products Annual 2005", October 2005.

# Appendix A

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## Interview List

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## Exhibit A.1: Farmed Salmon Interviews

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Name	Affiliation	Location
<b>A. INDUSTRY &amp; GOVERNMENT</b>		
1. Beattie, Mike	NB Government	St. George, NB
2. Bennett, Bernie	Target Marine Products	Sechelt, BC
3. Brown, Alex	Chile Government	Chile
4. Bullough, Keith	Pan Fish	Campbell River, BC
5. Castledine, Al	BC Agriculture & Lands	Victoria, BC
6. Cross, Stephen	Aquamatrix Research	Courtenay, BC
7. Gibson, Peter	Grieg Seafoods	Campbell River, BC
8. Gracie, Jim	Marine Harvest	Toronto, ON
9. Grierson, Ross	EWOS	Vancouver, BC
10. Halse, Nell	Cooke Aquaculture	Saint John, NB
11. Handrigan, Mike	Nfld Fisheries & Aquaculture	St. John's, Nfld
12. Infante, Rodrigo	Chilean Salmon Farmers' Association	Chile
13. Last, Gavin	BC Agriculture & Lands	Victoria, BC
14. Lavigne, Lauren	AAFC	Vancouver, BC
15. Lipsett, Kim	NB Government	Fredericton, NB
16. M <sup>ac</sup> Eachern, Myles	MacEachern & Fawkes	St. Stephen, NB
17. M <sup>c</sup> Farland, Mike	NB Government	Fredericton, NB
18. M <sup>c</sup> Vicar, Angela	Aqua Fish	Letang, NB
19. Meaney, Brian	Nfld Fisheries & Aquaculture	St. John's, Nfld
20. Moran, Hugh	NB Salmon Growers' Association	Letang, NB
21. Moyse, Steve	Nfld Fisheries & Aquaculture	St. John's, Nfld
22. Rideout, David	CAIA	Ottawa, ON
23. Robinson, Shawn	Nfld Fisheries & Aquaculture	Grand Falls, Nfld
24. Rose, Mike	Nfld Aquaculture Association	St. John's, Nfld
25. Saunders, Lorraine	BC Environment	Victoria, BC
26. Silva, Paula Morena	Chile Government	Chile
27. Stead, Richard	Canadian Embassy	Belgium
28. Stewart, Len	Cooke Aquaculture	Saint John, NB
29. Sweeney, Bob	Sweeney International Management Corp.	St. Stephen, NB
30. Taylor, Ken	Pan Fish	Seattle, WA
31. Walling, Mary Ellen	BC Salmon Farmers Association	Campbell River, BC
32. Woodland, Damon	ex-Heritage & Mainstream	Campbell River, BC
33.	"Major Salmon Farming Company"	BC
<b>B. BUYERS, MARKETERS &amp; DISTRIBUTORS</b>		
1.	Calkins & Burke Ltd.	Vancouver, BC
2.	Ipswich Shellfish	Ipswich, MA
3.	Lusamerica Fish	San Jose, CA
4.	Santa Monica Seafoods	Santa Monica, CA
5.	Slade Gordon & Co.	Boston, MA
6.	Stavis Seafood	Boston, MA
7.	"Major Retailer"	US

# Appendix B

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## Supplementary Data



## Exhibit B.1: Farmed Salmon Production and Value in Canada

	East						West	Canada
	Nfld	PEI	NS	NB	Que	Total	BC	Total
<b>A. Production tonnes*</b>								
1991	100	0	600	9,000	<100	9,700	21,900	31,600
92	100	0	400	10,000	<100	10,500	17,800	28,300
93	100	0	900	10,100	<100	11,100	23,000	34,100
94	<100	0	500	11,800	<100	12,400	21,300	33,700
95	100	0	600	14,500	<100	15,200	24,500	39,700
96	300	0	1,100	16,400	0	17,800	25,000	42,800
97	600	0	1,100	18,600	0	19,300	32,800	52,100
98	400	0	1,800	14,200	0	16,400	38,000	54,400
99	400	0	800	22,000	0	23,200	44,700	67,900
2000	700	0	3,400	29,100	0	33,200	44,100	77,300
01	1,100	0	2,600	33,900	0	37,600	61,200	98,800
02	1,300	0	1,900	38,900	0	42,100	75,600	117,700
03	1,500	0	5,200	33,100	0	39,800	65,400	105,200
04	3,300	0	2,000	35,000	0	40,300	56,300	96,600

	Farm Gate Value \$000			Farm Gate Price \$ per kg		
	East	West	Canada	East	West	Canada
<b>B. Farm Gate</b>						
1991	84,600	110,900	195,500	8.72	5.06	6.19
92	87,100	115,600	202,700	8.30	6.49	7.16
93	95,900	138,100	234,000	8.64	6.00	6.86
94	95,400	153,800	249,200	7.69	7.22	7.39
95	116,500	170,400	286,900	7.66	6.96	7.23
96	131,300	155,900	287,200	7.38	6.24	6.71
97	148,100	175,900	324,000	7.67	5.36	6.22
98	120,100	228,900	349,000	7.32	6.02	6.42
99	159,500	290,600	450,100	6.88	6.50	6.63
2000	205,400	278,400	483,800	6.19	6.31	6.26
01	199,600	270,900	470,500	5.31	4.43	4.76
02	213,100	288,900	502,000	5.06	3.82	4.27
03	212,500	255,800	468,300	5.34	3.91	4.45
04	200,000	212,200	412,200	4.96	3.77	4.27

\* Dressed Head-on

Note: Valuation concepts are not necessarily consistent between East and West Coasts and among East Coast provinces.

Source: Derived from Statistics Canada "Aquaculture Statistics 2004", Cat. No. 23-222-XIE, October 2005 (West Coast figures corrected for misreporting).

## Exhibit B.2: Canadian Exports into the US – Farmed Salmon

	Farmed Salmon Exports into US Market			
	Atlantic Salmon	Atlantic Fillets*	Other Salmon	Total
<b>Production tonnes</b>				
1992	10,375	NA	7,744	18,119
93	14,028	NA	5,242	19,270
94	18,566	NA	4,255	22,821
95	21,898	NA	6,363	28,261
96	23,261	NA	6,922	30,183
97	33,365	NA	4,703	38,068
98	37,141	3,887	5,122	46,150
99	38,981	5,485	3,647	48,113
2000	40,535	7,851	2,978	51,364
01	48,734	13,352	3,242	65,328
02	56,397	14,639	4,209	75,245
03	40,636	12,520	4,062	57,218
04	42,998	9,335	4,287	56,620
<b>Export Value \$000</b>				
1992	84,767	NA	49,545	134,312
93	113,472	NA	38,011	151,483
94	157,406	NA	33,509	190,915
95	182,883	NA	53,396	236,279
96	186,914	NA	54,262	241,176
97	271,158	NA	38,323	309,481
98	296,654	45,307	39,318	381,279
99	330,281	68,363	27,213	425,857
2000	327,399	94,944	23,249	445,592
01	387,282	153,325	19,571	560,177
02	420,284	160,545	22,316	603,145
03	295,799	131,418	23,757	450,974
04	262,583	94,575	24,560	381,718

\* Atlantic fillets probably included in Atlantic whole fish prior to 1998.

Source: Statistics Canada, "Aquaculture Statistics 2004" Cat No. 23-222-XIE, October 2005

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**Exhibit B.3: Imports of Farmed Salmon into the US**

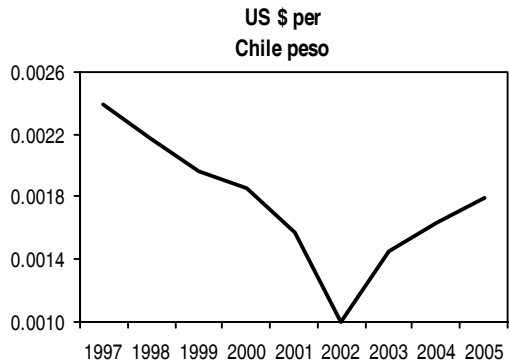
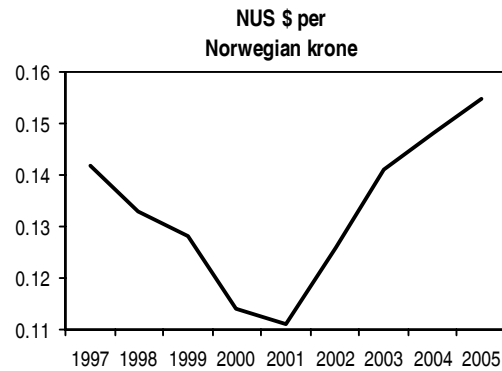
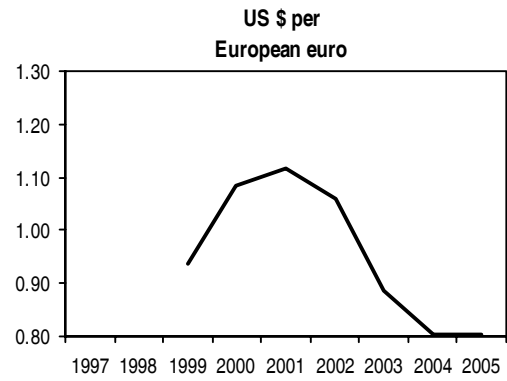
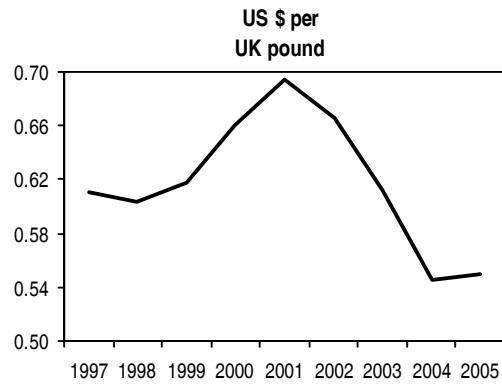
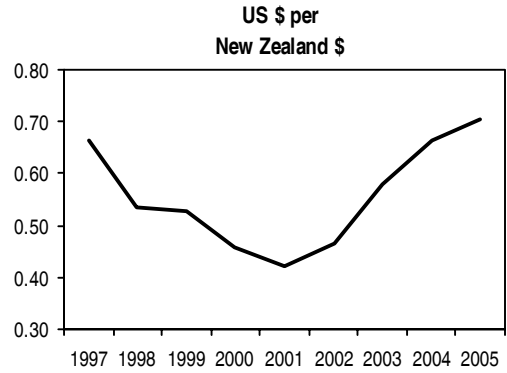
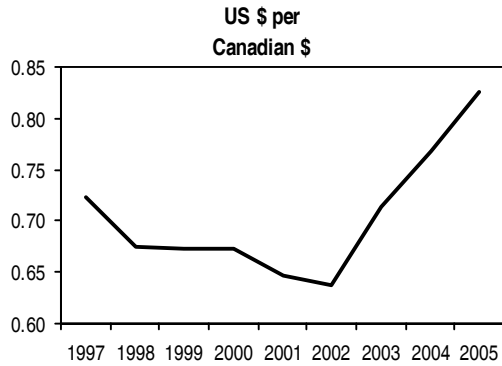

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	Whole Farmed Salmon \$millions US					All Farmed Salmon \$millions US				
	Canada	Norway	Chile	Other	Total	Canada	Norway	Chile	Other	Total
1992*	111.0	6.4	49.6	13.0	180.0	111.6	8.7	49.6	20.1	190.0
93*	118.0	9.6	61.0	13.0	201.6	118.7	14.9	61.0	17.0	211.6
94	141.0	8.6	49.7	9.2	208.5	142.2	13.4	49.8	17.8	221.3
95	172.9	9.6	56.4	8.1	247.0	177.5	19.2	100.0	14.8	311.5
96	177.1	7.5	56.4	12.0	253.0	182.5	14.5	124.3	18.7	340.3
97	223.5	5.1	40.9	12.1	281.6	244.0	14.2	156.4	21.0	435.6
98	225.8	7.5	35.8	19.2	288.3	258.4	21.3	239.8	26.8	546.3
99	239.5	11.0	17.4	45.5	313.4	287.4	65.3	244.1	67.4	664.2
2000	235.0	14.2	24.6	40.3	314.1	301.2	62.3	359.9	54.5	777.9
01	261.6	10.1	15.9	38.9	310.6	366.9	48.4	364.8	30.4	810.5
02	280.6	9.6	13.6	22.7	326.5	390.9	50.5	390.2	29.2	860.8
03	224.2	11.8	19.0	54.3	309.3	322.3	62.3	512.9	67.8	965.3
04	217.8	7.5	15.0	41.2	281.5	291.7	50.1	526.2	57.5	925.5
05	295.1	8.6	9.1	29.1	341.9	369.5	44.8	602.8	56.8	1,073.9

\* For years 1992 and 1993 split between whole and other fish are estimates.

Source: US National Marine Fisheries Service

## Exhibit B.4: Exchange Rate Movements 1997-2005



Source: Bank of Canada

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## **Exhibit B.5: The Salmon Farming Industry in Chile – A Profile**

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### **Background**

- Chile is the 2<sup>nd</sup> largest salmon producer in the world after Norway
- Chile has an extremely open economy with Free Trade Agreements with the USA, EU, China, Korea and many others

### **The Industry**

- 2005 production of 488,000 tonnes (383,000 Atlantics, 105,000 coho)
- 72% of \$2.1 US billion total aquaculture exports were from salmon
- industry is very concentrated with 11 players producing 80%
- 12 main zones in Chile with the 12th being the farthest south
  - today : 80% of salmon farming in 10th zone, 20% in 11th zone
    - : almost 90% of capacity of 10th zone is being utilized
  - tomorrow : growth will have to come from the remote 11th zone
- Chile forced to “leave the waste at home” due to long distances to main markets
- therefore industry focused on fillets, portions, smoked & marinated products
- size and value-added focus has allowed Chilean companies to sell directly to large retail chains (one of the major reasons for the success of Chilean salmon in Europe)
- Atlantics – half sold fresh (USA 90%, Brazil 8%) and half sold frozen (USA 37%, Japan 15%, Germany 14%)
- coho & trout – sold almost exclusively as frozen (mainly to Japan)
- most important markets have been USA and Japan, but exports to Europe increased this year
- market conditions favourable in 2005, with excess demand and high prices
- competitive position : favourable business environment is one of Chile’s main advantages
  - : cost of production 17% lower than Norway for dressed whole fish (before transportation to market)

### **Strengths – Opportunities**

- world cost leader with high growth potential
- strong market focus, flexibility & FTA help marketing
- proximity to world’s strongest pelagic resources, giving access to fish meal & fish oil for salmon feed at lowest prices in world
- focussed & capable management
- opportunities for foreign investors due to open economy

### **Weaknesses – Challenges**

- growth will likely have to come from 11th zone where labour is scarce and infrastructure is poor
- Chile is already importing fish oil for production of feed, fish oil likely will become a scarce resource
- high air freight costs for shipping fresh

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Source: ISB Research “ISB Seafood Industry Report – South America”, December 2005.