Aboriginal Aquaculture in Canada Initiative – National Socio-Economic Analysis Report

For

Waubetek Business Development Corporation

By

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EXECUTIVE SUMMARY

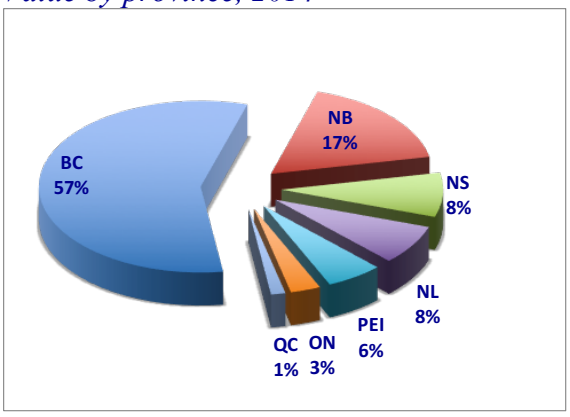
Background

Aboriginal communities in are in an excellent position to participate in aquaculture growth due to their aquatic resources, rights, and access to highly productive aquaculture sites. To assist development, the Aboriginal Aquaculture in Canada Initiative (AACI) was established. This study examines the economic impact of Aboriginal aquaculture in the Canadian context and highlights opportunities and challenges for growth.

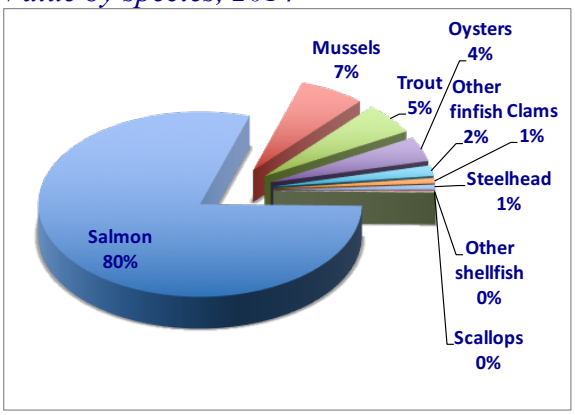
Canadian aquaculture

Statistics Canada's reported quantity and value of national output is divided about equally between the Pacific and Atlantic coasts, though British Columbia leads all other provinces, typically accounting for about 50-60% of total production value. Figures below provide a breakdown of 2014 national output value ($962 million) by province, and a breakdown of value by species. Salmon is the leading species at 82% of the total.

Value by province, 2014



Value by species, 2014



Source: Statistics Canada, Cansim Table 003-0001.

The provincial values of production (output or sales) are used to run the Statistics Canada inter-provincial input-output model. The direct, indirect, and induced impacts from one year of aquaculture activity yield the following impact results:

- **Output:** There are about $1.8 billion worth of sales linked to aquaculture. For every dollar of sales in aquaculture production another $1.47 in sales occurs elsewhere in the economy.
- **GDP:** A total of $701 million in added-value in Canada is related to aquaculture. For every dollar of GDP in aquaculture production another $2.00 in GDP is gained elsewhere in the economy.
- **Income:** A total of $407 million worth of income is generated in Canadian aquaculture. For every dollar of income in aquaculture production another $2.21 of income is gained elsewhere in the economy.
- **Jobs:** A total of 9,273 full-time equivalent jobs are dependent on Canadian aquaculture. For every direct aquaculture job another 1.4 jobs are created elsewhere in the economy.

Aboriginal aquaculture

A survey is needed to examine Aboriginal aquaculture activity since this data is not available from government sources. The survey captured responses from 40 of 68 contacts involved in Aboriginal aquaculture (58% response rate) with an equal split between planning aquaculture operations (20) and those that are fully operational (20).

The total number of reported jobs (538) indicates the number of people engaged in aquaculture. Key observations from the Aboriginal aquaculture survey include:

- **Hatcheries:** offer average salaries of $35,000 per FTE and represents about 20% of the income earned in Aboriginal aquaculture activities.
- **Finfish aquaculture:** offers average salaries of $38,000 per FTE and represents about 54% of the income earned in Aboriginal aquaculture activities.
- **Shellfish aquaculture:** offers average salaries of $13,000 per FTE and represent about 2% of the income earned in Aboriginal aquaculture activities.
- **Processing:** offers average salaries of $30,000 per FTE and represent about 24% of the income earned in Aboriginal aquaculture activities.
- **Supply services and other**: the supply services income is small and is rolled into processing to protect confidentiality.

Building on the survey information and average economic impact metrics from Canadian aquaculture, the Aboriginal aquaculture impacts are as follows:

Estimated Aboriginal aquaculture economic impacts, 2014

($)	Output	GDP	Salaries	Jobs
Direct	41,462,005	13,195,447	7,746,667	217
Indirect	45,263,862	17,266,468	10,636,314	210
Induced	15,591,793	9,155,479	5,192,585	97
Total	**102,317,660**	**39,617,394**	**23,007,399**	**524**

Source: Statistics Canada interprovincial input-output model and Gardner Pinfold survey of Aboriginal aquaculture in Canada.

The direct activities all relate to Aboriginal participants, and 185 of the indirect jobs and $5.9 million in corresponding salaries are captured by Aboriginals. Therefore, Aboriginal aquaculture participants account for 402 FTE jobs with salaries totaling $7.9 million.

- **Output:** The total sales associated with direct, indirect, and induced activity flowing from Aboriginal aquaculture in Canada is $102 million.
- **GDP:** About $39.6 million worth of added-value is linked to Aboriginal aquaculture in Canada.
- **Spinoffs:** Aboriginal aquaculture is generating substantial spinoffs to the Canadian economy. Another 123 jobs are generated in the economy with additional salaries amounting to $9.3 million.

"Aboriginal aquaculture economic impacts represent about 5.7% of all economic activity linked to aquaculture in Canada."

Growth potential

The report discusses broad trends in global demand for aquaculture, supply competition, disease outbreaks and unforeseen events affecting supply, opportunities and limitations for expansion in Canada, technology advances, alternative species development, and economic factors including Canadian currency exchange rates.

The recently released Senate report on aquaculture in Canada supports 5% annual growth in aquaculture across Canada over the next decade. The Aboriginal aquaculture survey respondents suggest higher growth rates of 16% are possible for Aboriginal participants, but challenges are recognized. At these rates the following five-year and ten-year employment gains are possible:

- **New direct and indirect jobs:** 441 in 5 years, and 881 in 10 years
- **New direct and indirect FTE:** 329 in 5 years, and 658 in 10 years

The top two challenges for operating initiatives are recruiting qualified employees and access to financing. Not surprisingly, the top challenges are the same for those planning aquaculture initiatives but the order of importance is reversed.

The report concludes with survey respondent views on positive and negative aspects of Aboriginal aquaculture planning and operations. The views are balanced, covering a range of economic, social, and environmental benefits on the one hand and concerns on the other.

I

INTRODUCTION

1. Background

Aboriginal communities in are in an excellent position to participate in aquaculture growth due to their aquatic resources, rights, and access to highly productive aquaculture sites. To assist development, the Aboriginal Aquaculture in Canada Initiative (AACI) was established. Regional Aquaculture Business Development Teams have been created to provide technical and business support services to First Nations individuals or communities with an interest in developing aquaculture business opportunities.

The aquaculture industry is expected to grow and there is undeveloped potential in aquaculture for First Nations and Aboriginal entrepreneurs across Canada. It is important to increase participation of Aboriginals in the aquaculture sector and gain economic benefits for their communities. It is important to know the current status of Aboriginal participation in aquaculture and provide a baseline for tracking future progress.

Several studies have estimated the economic impact of Canadian aquaculture at a macro scale, either at national or provincial levels (DFO, 2008; Gardner Pinfold 1998, 2002, 2008a, 2008b, 2009). Some studies have also examined the economics of aquaculture at a community level including Aboriginal involvement. (Gardner Pinfold, 2013; AAA 2012) However, this study provides a coherent report combining available information needed to set Aboriginal participation in context.

2. Purpose and objectives

This study is needed to help fill a gap in knowledge amongst decision makers and the public and to inform national and local aquaculture development processes. This will also serve as a baseline for tracking the development of Aboriginal aquaculture in Canada. More specifically, the study objectives are as follows:

Part A, describe the current status of the Canadian aquaculture sector, including:

- The current status of Canadian aquaculture including production and economic activity by province and species, in direct and service and supply sector;

Part B, there is a need to present Aboriginal participation statistics for comparison with, and in the context of, the overall Canadian aquaculture sector. This will identify the percentage of Aboriginal business owners, managers, entry-level employees as compared to non-Aboriginals.

- A list of Aboriginal communities or members producing seafood products from aquaculture or supplying such companies with goods and/or services;

- A list of non-Aboriginal private sector companies having aquaculture partnerships in place with Aboriginal communities.
- Estimates of economic activity associated with Aboriginal participation in aquaculture.

Part C, the assessment must provide a realistic outlook for growth in the employment of Aboriginal Canadians in the aquaculture sector based on:

- Projected growth of Canadian aquaculture by province and territory;
- Opportunities by species;
- Market outlook;
- Opportunities in partnership development;
- Opportunities in the service and supply sector;
- Projected job creation for First Nations;
- Projected economic and social benefit aquaculture can have for First Nations communities; and
- Identify issues and constraints experienced by First Nations seeking involvement in aquaculture.

II

METHODOLOGY

Part A. Canadian aquaculture

Value of output

The most reliable data on aquaculture activity in Canada comes from two broad sources: Statistics Canada and Fisheries and Oceans Canada. These departments collect information from each of the provinces. Volume and value of production by province is the starting point for analysis. The latest available information is for 2014 and this aligns with the year of reporting for the Aboriginal aquaculture survey. Some provinces and territories do not have large enough aquaculture sectors to satisfy confidentiality requirements for Statistics Canada and DFO.

The production and value of aquaculture includes the amount and value produced on sites and excludes hatcheries or processing. Even though many aquaculture companies are vertically integrated with hatcheries, grow-out, and processing, we adopt the same separation for Aboriginal aquaculture analysis to make results comparable.

Annual variation

One final issue that must be recognized in utilizing the national statistics as context for comparison with Aboriginal aquaculture activity is that there was a drop of 23.8% in national output from 2013 to 2014. Statistics Canada's "Aquaculture Statistics" publication (Cat. 22-222-X) reports that some aquaculture farms harvested their fish in 2013 instead of 2014 to avoid the onset of disease. This caused sales to appear higher than expected in 2013 and lower than expected in 2014. The following series of three tables shows the 2013, 2014, and year to year percentage changes in finfish and shellfish aquaculture output by province.

Table 2.1: Canadian aquaculture volume and value by province, 2013

	BC	ON	QC	NB	NS	PEI	NL	CAN
Volume (mt)								
Total Finfish	75,808	3,602	1,263	18,837	6,780	0	22,196	130,337
Total Shellfish	8,450	0	491	790	1,968	25,706	4,354	41,760
Total Aquaculture	**84,258**	**3,602**	**1,754**	**19,627**	**8,748**	**25,706**	**26,550**	**172,097**
Value ($000s)								
Total Finfish	485,569	18,505	10,854	117,334	43,386	3,229	181,833	870,346
Total Shellfish	21,921	0	925	5,724	10,871	37,970	15,139	92,549
Total Aquaculture	**507,490**	**18,505**	**11,779**	**123,058**	**54,257**	**41,198**	**196,972**	**962,895**

Source: DFO Statistics. Notes: Provinces without data are not included. The production and value of aquaculture includes the amount produced on sites and excludes hatcheries or processing. Shellfish also includes some wild production. Note: PEI value with no reported volume is not an error.

Table 2.2: Canadian aquaculture volume and value by province, 2014

	BC	ON	QC	NB	NS	PEI	NL	CAN*
Volume (mt)								
Total Finfish	56,276	4,210	1,144	17,184	7,102	0	5,980	93,656
Total Shellfish	10,127	0	416	893	1,641	23,590	3,260	39,927
Total Aquaculture	66,403	4,210	1,560	18,077	8,743	23,590	9,240	133,583
Value ($000s)								
Total Finfish	389,813	21,800	9,423	117,744	56,063	3,410	42,446	649,942
Total Shellfish	22,128	0	1,052	6,483	4,295	37,830	11,640	83,428
Total Aquaculture	411,941	21,800	10,475	124,227	60,358	41,240	54,086	733,370

*Source: DFO Statistics. Notes: Provinces without data are not included. The production and value of aquaculture includes the amount produced on sites and excludes hatcheries or processing. Shellfish also includes some wild production. *The Canada total is more than the sum of the provinces and may represent all other provinces not shown in the table. Note: PEI value with no reported volume is not an error.*

Table 2.3: Canadian aquaculture volume and value 2013 to 2014 % change by province

	BC	ON	QC	NB	NS	PEI	NL	CAN
Volume (mt)								
Total Finfish	-25.8%	16.9%	-9.4%	-8.8%	4.7%	0.0%	-73.1%	-28.1%
Total Shellfish	19.8%	0.0%	-15.3%	13.0%	-16.6%	-8.2%	-25.1%	-4.4%
Total Aquaculture	-21.2%	16.9%	-11.1%	-7.9%	-0.1%	-8.2%	-65.2%	-22.4%
Value ($000s)								
Total Finfish	-19.7%	17.8%	-13.2%	0.3%	29.2%	5.6%	-76.7%	-25.3%
Total Shellfish	0.9%	0.0%	13.7%	13.3%	-60.5%	-0.4%	-23.1%	-9.9%
Total Aquaculture	-18.8%	17.8%	-11.1%	0.9%	11.2%	0.1%	-72.5%	-23.8%

Note: PEI value change with no reported volume change is not an error.

Part B. Aboriginal aquaculture

Survey approach

Statistics Canada does have some Aboriginal labour force data from the 2011 National Household Survey (NHS), and the Aboriginal Peoples Survey (APS). Gardner Pinfold examined the public use microdatafiles (PUMF), but found the information lacking the detail required for analysis specific to Aboriginal aquaculture. This is the primary reason for employing a survey to collect information about Aboriginal aquaculture activity. A second reason is to gather perspectives on Aboriginal aquaculture growth potential, barriers to development, positive and negative experiences with aquaculture in Aboriginal communities.

Contact list

The project Steering Committee (SC) provided initial contact information for Aboriginal aquaculture operations across Canada. There are a total of 68 contacts with email addresses that could be used to administer an online survey. The survey captured responses from 40 of those (58% response rate) with an equal split between those planning aquaculture operations (20) and those that are fully operational (20).

The list of contacts is presented in the results section and it indicates the First Nation and company affiliations for each contact, as well as the type of aquaculture and species they are engaged in.

Within the list there are a number of instances with more than one contact for a given aquaculture operation. This was deemed to be useful in gathering perspectives from key people, but double-counting is avoided for the economic analysis.

Survey design

Working with the SC, the introduction and questions for the survey were finalized as shown in the Appendix. The approach taken led to a more comprehensive survey recognizing that this might appear somewhat onerous for respondents. The survey provides the depth needed to understand employment by species and by type of aquaculture (e.g. hatchery, finfish, shellfish, processing, supply and services). The survey seeks outlooks on growth potential, barriers to growth, and perspective on positive and negative aspects of aquaculture development.

The survey was administered with Qualtrics online survey software. The software allows some questions to be built based on responses to previous questions. This helped to streamline the survey somewhat and tailor it to specific respondents. The data were downloaded to Microsoft Excel for analysis and tabulation to produce the results shown in this report.

Validating responses

In some instances, respondents provided different numbers of employees in separate questions. If the number of employees by species and aquaculture type did not match the number reported by occupation type, then Gardner Pinfold would contact respondents to confirm the correct number.

Double-counting

Where more than one response was obtained for a particular aquaculture operation (e.g. Aboriginal community member and non-Aboriginal company partner) the employment and aquaculture activity information was not counted twice in the economic analysis.

Non-responses

After sending initial email invitations to participate in the survey, three more email reminders were sent to those that did not complete the survey. Additional effort was made by Gardner Pinfold to call all non-respondents, and Steering Committee members also contacted non-respondents to encourage participation.

Non-responses can arise from contacts being too busy, having a perception that the survey is a burden, being uncertain about how survey responses will be used, or being fearful that sensitive personal or corporate information will be exposed. From talking to non-respondents that could be reached by phone it seems that a mix of these factors may be involved.

Handling non-responses is most important for the economic analysis where a complete picture of Aboriginal aquaculture activity in Canada is sought. Estimates are made to fill the missing information as best as possible. This is done by assessing the types and scale of aquaculture that is known to be carried out by non-respondents and estimating employment and level of activity that is likely to be associated.

Part A&B. Economic impact analysis

Economic analysis is presented in both Part A and B that rely on the same approaches described here. The Statistics Canada inter-provincial I/O model is used for the analysis since Statistics Canada provides credibility and consistency over time for comparisons in the future. For the national aquaculture analysis, the expenditures (outputs) compiled for each province are aligned with economic input-output model analysis (I/O model). The Aboriginal aquaculture expenditures compiled from the survey were similarly aligned with the model for analysis.

A separate model run was conducted for each province so that provincial expenditure values would be handled appropriately to generate within-province impacts. The structure of each provincial economy is different, and the degree of aquaculture support services and supplies differ greatly across provinces.

The model is built on Revenue Canada data and other sources showing the transactions and relationships between industries, sectors, and sub-sectors of the economy. The I/O model measures how direct expenditures on goods and services create output (sales), gross domestic product (GDP, added value), income (salary and wage earnings), and jobs (full-time equivalents, FTEs) in the economy:

- **Gross value of output** – Economic impact arises as industry expenditures work their way through the economy. Processor spending on inputs becomes the revenue of many another companies, which they in turn spend on inputs for the goods and services they produce, and so on. Gross value of output, then, is the cumulative sum of these sales and purchases of intermediate and final goods and services. These transactions occur in the province, and also spill over to other provinces where supply and service industries may be located.
- **Gross Domestic Product** – GDP captures the value of final goods and services produced in the economy, providing a measure of the value-added or income generated (wages and salaries for labour and returns to and of capital in the form of profit and depreciation).
- **Labour Income** – this captures payments in the form of wages and salaries earned in an industry. Returns to labour in the form of wages, salaries and earnings form a key component of GDP.
- **Jobs (full-time equivalent employment)** – This captures the numbers employed, expressed in full-time equivalent jobs (FTE). One FTE is one person working full-time for a full year.

- **Tax revenues to government –** This includes all three levels of government, but excludes corporate taxes and royalty arrangements that are specific to certain industries and companies.

Each of the above types of impacts are reported from Statistics Canada input-output modeling according to direct, indirect, and induced impacts described as follows:

- **Direct impact** – refers to the impact generated at the food and beverage processing facilities. Direct GDP refers to the value added by the processor, while direct employment and labour income refers to the jobs and payroll at the processing facility.
- **Indirect impact** – refers to the impacts arising from purchased inputs triggered by the direct activity. For example, a bakery buys equipment from manufacturers, maintenance from service companies, energy from utilities, ingredients and other consumables from various suppliers. These suppliers in turn buy their inputs from other companies, and so on. Taken together, the goods and services provided as inputs to the processors is reported as indirect impacts.
- **Induced impact** – refers to the demand created in the broader economy through consumer spending of incomes earned by those employed in direct and indirect activities. It may take a year or more for these rounds of consumer spending to work their way through an economy.

Part C. Growth potential

The assessment of growth potential relies on two sources of information, namely the survey and secondary sources regarding aquaculture developments in Canada.

The survey included questions about the outlook for Aboriginal aquaculture. Those respondents in planning stages for new developments indicated the employment and activity level anticipated. Respondents with on-going operations indicated whether they expect growth in the next three years and what the percentage might be. These are only indications, but Aboriginal aquaculture operators are likely in the best position to assess their circumstances.

The trends in aquaculture development in Canada offer additional insight into future potential growth. The industry in Canada has generally planned and anticipated more growth than has actually occurred. This is sometimes the result of unforeseen developments locally or even globally that affect supply and demand for aquaculture products. Finally, there are constraints to further aquaculture development in some parts of the country. This will be discussed further below.

III

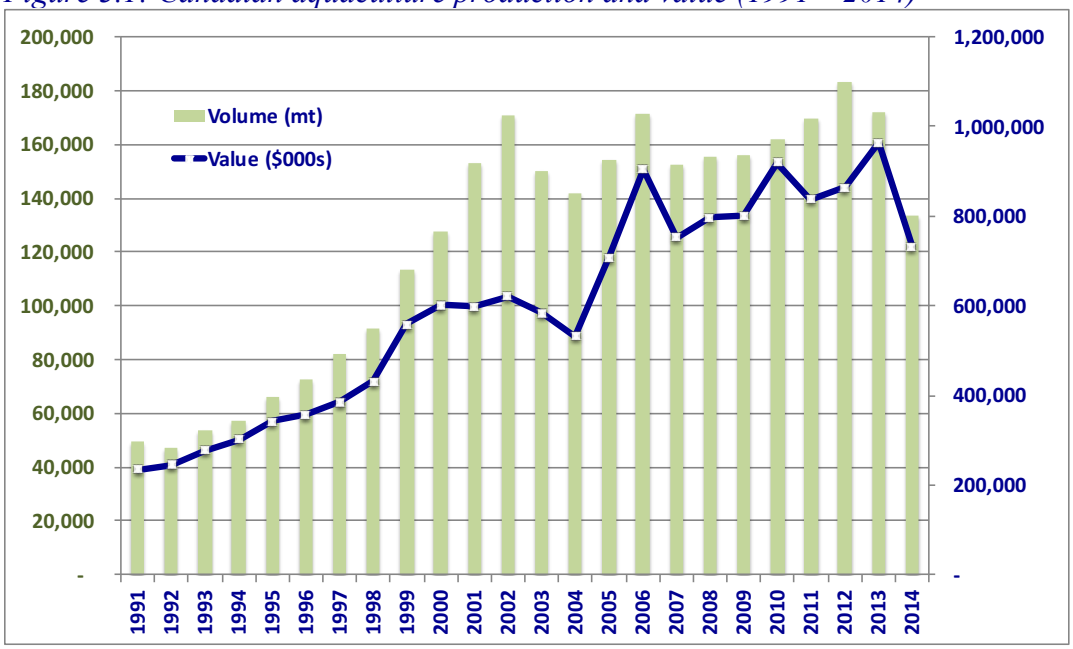
RESULTS

Part A. Canadian aquaculture

Interest in what are today the main farmed species – salmon, mussel, trout and oyster – began in the 1970s. The early years were marked by considerable research and development aimed at selecting the best strains and understanding the habitat conditions that produced optimal growth. The industry – particularly salmon and mussel – began to take off in the late-1980s.

Aquaculture production volume and value grew substantially in Canada during the 1990s (Figure 1.1), primarily driven by finfish development. From 1991 to 2014 salmon production increased nearly 3-fold, rising from 34,000 to over 94,000 mt, with a value exceeding $733 million in 2014. Shellfish saw a four-fold increase, from 10,000 to 40,000 mt, and a value over $83 million in 2014. However, salmon production has been relatively stable in the last ten years while shellfish production continued to grow slowly. The drop in 2014 reflects harvesting that took place in 2013 to pre-empt disease onset in some salmon sites.

Figure 3.1: Canadian aquaculture production and value (1991 – 2014)



Source: Statistics Canada, Cansim Table 003-0001.

The quantity and value of national output is divided about equally between the Pacific and Atlantic coasts, though British Columbia leads all other provinces, typically accounting for about 50-60% of total production value. Figure 2 provides a breakdown

of national output value ($962 million) by province, while Figure 3 gives a breakdown of value by species. Salmon is the leading species at 82% of the total.

Figure 3.2: Value by province, 2014

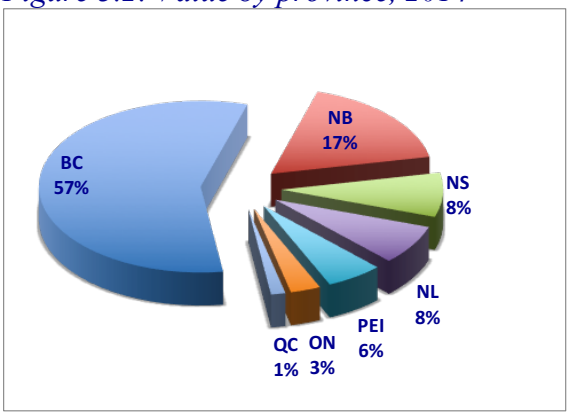
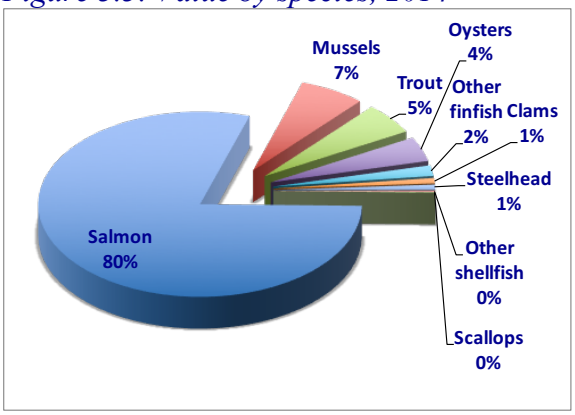


Figure 3.3: Value by species, 2014



Source: Statistics Canada, Cansim Table 003-0001.

There are many communities on the east and west coasts, as well as in central Canada, where aquaculture generates thousands of jobs and millions of dollars in income. It does so through direct activity at the farm sites, and also in indirect ways through backward linkages to suppliers of equipment, feed and services, and forward linkages to processors and marketers. In many cases, these involve First Nations communities where economic opportunity otherwise tends to be limited. Aquaculture can make meaningful contributions to those communities by strengthening individual and community capacity, improving incomes and quality of life, and contributing to social cohesion.

The 2014 value of production by province shown in the table below is the starting point for economic impacts analysis. As discussed in the methodology section, the 2014 values are artificially low and this should be kept in mind when comparisons are made with Aboriginal activity.

Table 3.1: Canadian aquaculture volume and value by province, 2014

	BC	ON	QC	NB	NS	PEI	NL	CAN
Volume (mt)								
Total Finfish	56,276	4,210	1,144	17,184	7,102	0	5,980	93,656
Total Shellfish	10,127	0	416	893	1,641	23,590	3,260	39,927
Total Aquaculture	66,403	4,210	1,560	18,077	8,743	23,590	9,240	133,583
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Total Aquaculture	411,941	21,800	10,475	124,227	60,358	41,240	54,086	733,370

Source: DFO Statistics. Notes: Provinces without data are not included. The production and value of aquaculture includes the amount and value produced on sites and excludes hatcheries or processing. Shellfish also includes some wild production.

The provincial values of production (output or sales) are used to run the Statistics Canada inter-provincial input-output model. A separate run was conducted for each province to

produce the following key economic indicators including output, added-value (gross domestic product; GDP), income, and jobs (part-time and full-time).

Table 3.2: Canadian aquaculture economic impacts by province, 2014

($000s)	BC	ON	QC	NB	NS	PEI	NL	Total
Output								
Direct	411,941	21,800	10,475	124,227	60,358	41,240	54,086	733,370
Indirect	322,396	168,296	89,247	69,642	96,120	17,357	39,615	800,616
Induced	100,824	115,758	35,406	22,418	24,115	12,451	8,974	275,784
Total	835,161	284,054	135,128	216,286	180,594	71,048	102,675	1,809,770
GDP								
Direct	128,154	9,281	5,098	22,340	22,420	30,531	21,784	233,398
Indirect	119,792	73,038	32,674	22,276	31,825	8,492	15,367	305,405
Induced	65,597	51,042	18,350	12,579	13,729	7,971	5,598	161,940
Total	313,544	133,361	56,121	57,195	67,973	46,994	42,749	700,743
Income								
Direct	63,759	3,993	2,214	20,875	8,468	17,702	8,535	126,972
Indirect	80,038	45,353	18,888	14,654	22,118	5,449	10,092	188,133
Induced	37,448	30,382	10,607	7,093	7,742	4,454	2,888	91,845
Total	181,245	79,727	31,709	42,622	38,327	27,605	21,516	406,949
Jobs								
Direct	1,718	116	82	678	263	618	288	3,838
Indirect	1,584	811	394	335	508	134	160	3,713
Induced	657	533	221	152	170	98	61	1,722
Total	3,958	1,460	696	1,165	941	851	509	9,273

*Source: Statistics Canada Interprovincial input-output model * The direct output for each province matches the previous table output by province, but the total for Canada does not because economic impacts are built up from each province with data, the provinces with suppressed data are not included.*

- **Output:** There are about $1.8 billion worth of sales linked to aquaculture. For every dollar of sales in aquaculture production another $1.47 in sales occurs elsewhere in the economy.
- **GDP:** A total of $701 million in added-value in Canada is related to aquaculture. For every dollar of GDP in aquaculture production another $2.00 in GDP is gained elsewhere in the economy.
- **Income:** A total of $407 million worth of income is generated in Canadian aquaculture. For every dollar of income in aquaculture production another $2.21 of income is gained elsewhere in the economy.
- **Jobs:** A total of 9,273 full-time equivalent jobs are dependent on Canadian aquaculture. For every direct aquaculture job another 1.4 jobs are created elsewhere in the economy.

For each economic indicator, the following table shows the average impact on a per job basis. For instance, the average direct output per job ($191,069) is the result of dividing the direct output ($733,370) by the direct jobs (3,838). This means that on average about $191,000 in sales is linked to each employee. Average GDP per employee, average

salaries, and other values at indirect and induced levels are calculated in the same manner.

Table 3.3: Average economic impacts per aquaculture job in Canada, 2014

($)	Output	GDP	Salaries
Direct	191,069	60,809	33,081
Indirect	215,619	82,250	50,667
Induced	160,195	94,067	53,350

Source: Statistics Canada Interprovincial input-output model. Note: Induced averages are based on direct and indirect combined jobs.

These averages will be used in the next section for calculations of economic impacts and comparison with Aboriginal aquaculture activity.

Part B. Aboriginal aquaculture

The table below presents contacts in each province according to the First Nation and/or company they are associated with, and the type of aquaculture (e.g. grow-out, processing) and species they are involved with.

Table 3.4: Community and company contacts for Aboriginal aquaculture in Canada

Prov	Contacts	Community / Company	Aquaculture Activity
British Columbia			
1	Aaron Reith	Scia'new FN / Sea Vision	Planning sea cucumber grow-out
2	Brian and Kelly Flurer	Flurer Smokery / Golden Eagle Sablefish / Island Sea Farms	Processing salmon, mussel, sablefish, halibut, black cod, white sturgeon, tuna, oysters, mussels, and prawns
3	Carole Perrault	Quatsino FN / Agri-Marine Holdings Inc.	Salmon planning
4	Chenoa Akey / Ray Gautier	Stz'uminus FN / Thuy'she'num Property Management	Clam hatchery and grow-out operations, geoduck potential
5	Chief Clint Williams	Sliammon FN	Oyster farm, planning geoduck
6	Chief Harold Sewid	Qwe'Qwa'Sot'Em Faith Aquaculture Ltd / Marine Harvest and Cleanwater Shellfish	Salmon grow-out operations
7	Ian Roberts	Marine Harvest	Salmon grow-out operations
8	Erin Latham / Conrad Browne	Gwa'sala-Naxwada'xw FN / Marine Harvest	Shellfish potential
9	Frank Dragon	Ka:'yu:'k't'h'/Che:k:tles7et'h' FN	Shellfish
10	Gordon Planes	T'Sou-ke FN / Salish Strait Seafoods	Planning geoduck, salmon grow-out?
11	James Walkus	Walkus Fishing Company / Marine Harvest	Salmon grow-out
12	Josephine Mrozewski	Kuterra General Partner Inc (Namgis FN)	Land-based salmon grow-out
13	Ken Barth?	Tlatlasikwala FN / Marine Harvest	Salmon grow-out
14	Larry Greba	Kitasoo Aquafarms Ltd - Kitasoo/Xai'xais FN/Marine Harvest	Salmon grow-out
15	Larry Johnson	Huu-ay-aht FN	Clam, oyster, barnacles, and kelp potential
16	Laurie Jensen	Cermaq / Ahousaht FN	Salmon grow-out operations
17	Linda Heimstra	Ka:'yu:'k't'h'/Che:k:tles7et'h' FN / Golden Eagle Aquaculture	Sablefish hatchery, grow-out, and processing operations
18	Lisa Stewart / Tim Rundle	Tla-o-qui-aht FN / Creative Salmon	Organic Chinook salmon hatchery, grow-out, and processing
19	Mark Biagi	Kitsumkalum FN	Geoduck planning
20	Marylyn Hutchinson	Grieg Seafoods / Tlowitsis FN	Salmon grow-out operations
21	Noah Plonka	Toquaht FN	Manilla clam, Pacific oyster, Geoduck planning
22	Patti Berlinger	Skretting Feeds	Aquaculture feed

British Columbia (cont.)		Community / Company	Aquaculture Activity
23	Richard Hardy	K'omoks FN / Marine Harvest	Salmon, Manila Clam, Pacific Oyster, Butter Clam, Horse Clam, Littleneck Clam, Nuttall Cockle, Eastern Blue Mussel, Gallo Mussel, Western Blue Mussel
24	Robert Mills	Skidegate FN	Geoduck planning
25	Russ Jones	Old Masset Village	Pacific scallop, planning geoduck
26	Sam Bowman	Metlakatla Development Corporation / Coastal Shellfish Corporation	California Sea Cucumber, Geoduck Clam, Japanese Scallop, Manila Clam, Pacific Oyster, Pacific Scallop, Weathervane Scallop
27	Sarah Harrison	Mowachaht / Muuchalaht First Nation	Salmon grow-out operations
28	Sid Quinn	Sechelt FN	Shellfish planning
29	Ted Assu	We Wai Kai FN / Marine Harvest	Pacific scallop
30	Thomas Smith	Tla-o-qui-aht First Nations / Creative Salmon / Happy as a Clam Shellfish Ltd	Salmon grow-out operations
31	Tina Wesley	Klahoose FN / Klahoose Shellfish Limited Partnership	Eastern Blue Mussel, Gallo Mussel, Kumamoto Oyster, Pacific Oyster, Western Blue Mussel, Manila Clam, California Sea Cucumber, Green Sea Urchin, Red Sea Urchin, European Oyster, Kumaoto Oyster
32	Tom Broadley	Salish Seafoods, Pentlatch Seafoods, K'omoks FN/Marine Harvest	Salmon, Manila clam, Pacific oyster, Butter clam, Horse clam, Littleneck clam, Nuttall cockle, East blue mussel, Gallo mussel, West Blue mussel
33	Trevor / Wally Samuel	Ahousaht FN / Cermaq	Planning, shellfish, finfish, hatchery
34	William Gladstone	Heiltsuk Processing Plant	Processing potential salmon, sea cucumber, sea urchin, manilla clam
Manitoba			
35	Bruce Hardy	Myera Group Inc.	Planning alternative aquaculture
36	Lyle Morrisseau	Sagkeeng FN	Planning Rainbow trout grow-out
Ontario			
37	Armando and Rose Shawanda	Fulltime Fisheries	Trout grow-out
38	Ben and Pete Kanasawe	Buzwah Fisheries	Salmon grow-out
39	Brian Rogers	Serpent River FN	Planning floating closed-containment salmon, trout, tuna or yellow croaker grow-out
40	Clarke Rieck	Lyndon Fish Hatcheries	Trout hatchery operations
41	Darin Kropf	Kropf Industrial Inc.	Aquaculture cage manufacturer
42	Emilio Tomaselli	Sheshegwaning FN	Water quality monitoring, pilot study
43	Gail Jocko	Shawanaga FN	Wallaye hatchery potential
44	Geoff Cole	Cole-Munroe Foods/Cole-Mar	Trout grow-out operations
45	Gord Cole	Aqua-Cage Fisheries Ltd	Trout grow-out operations

Ontario (cont.)		Community / Company	Aquaculture Activity
46	Jeff Mountjoy	Martin Mills Inc. / Aundeck-Omni-Kaning (AOK) FN	Aquaculture feed, Trout
47	Kim Cowan	Temagami FN	Trout grow-out potential
48	Ross Hebert	Hebert Fisheries	Whitefish potential
49	Terence Corbiere	Wikwemikong FN / Buzwah Fishery	Salmon grow-out
Quebec			
50	Adam Kenedy / Fred Vicaire	Gesgapegiag	Salmon grow-out operations
51	Catherine Lambert Koizumi	AGHAMM	Seaweed farming
52	Dennis Murray	Caviars Emmerance	Lumpfish farm, salmon potential
53	Kirt Dedam	Listuguj / Mallet Research Services Ltd.	Scallop farm potential
New Brunswick			
54	Bill Ward	Metepenagiag	Salmon grow-out operations
55	Blayne Peters / Dawn Ann Levi	Elsipogtog Fisheries	Oyster hatchery operating
56	Cecil Mitchell	Rainbow Net and Rigging	Trout, salmon, oysters, mussels operating
57	Chief Ken Barlow	Indian Island	Oyster farm and holding plant
58	Clarence Blanchard	Future Nets & Supplies Ltd.	Aquaculture supplies
59	James LaBillois	Eel River Bar	Oyster Farm, Clam Management Plan
60	Jesse Paul	St. Mary's	Arctic char farm partnership
Prince Edward Island			
61	Mike Randall	Lennox Island	Shellfish hatchery
62	Roger Sark	Abegweit	Biodiversity enhancement hatchery, Oyster farm, scallop and halibut farms
Nova Scotia			
63	Allison MacIsaac	Eskasoni	Environmental monitoring service, Oyster hatchery and grow-out, American eel potential
64	Hubert Nicholas	Membertou	Halibut farming partnership
65	Merina Sark	Paqtnkek	Oyster spat collection
66	Phil Drinnan	Waycobah	Steelhead, oyster, trout, grow-out, processing, and transport operations
67	Terry French	Millbrook / Blue Two	Trout hatchery operating
Newfoundland and Labrador			
68	Shayne McDonald	Miawpukek	Trout grow-out, Aquaculture tow service

The next sections describe aboriginal aquaculture activity according to the responses from 40 of 68 contacts invited to complete the survey. Some of the non-respondent information was provided by participants in the survey where more than one contact was available for a given aquaculture operation. About three-quarters (75%) of the data the sections below comes directly from survey collection and the balance uses estimates based on other sources of information.

Aboriginal employment and salaries

The next two tables breakdown jobs by full-time, part-time, and seasonal positions (Table 3.5), then breakdown according to level of position by aquaculture activity (Table 3.6).

Table 3.5: Aboriginal aquaculture survey jobs by activity, 2014

Activity	FT	PT	Seasonal	Total
Hatchery	55	13	49	117
Finfish	176	37	-	213
Shellfish	8	-	49	57
Processing	69	72	9	151
Supply	-	3	-	-
Other	-	-	-	-
Total	308	123	107	538
FTE*	308	61.3	32.2	401.5

*Source: Gardner Pinfold Survey of Aboriginal Aquaculture in Canada, 2015 *Full-time equivalent (FTE) calculations assume 50% for part-time (PT), and 30% for seasonal.*

Table 3.6: Aboriginal aquaculture survey job levels by activity, 2014

Activity	Entry	Experience	Specialize	Supervisor	Management	Owner/Operator	Total
Hatchery	76	36	3	1	-	-	117
Finfish	24	165	7	9	5	3	213
Shellfish	45	6	-	4	1	1	57
Processing	44	102.28	-	1	-	3	151
Supply	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
Total	190	309	10	17	7	6	538

Source: Gardner Pinfold Survey of Aboriginal Aquaculture in Canada, 2015

The total number of jobs in each table (538) indicates the number of people engaged in aquaculture. For economic analysis we convert this to full-time equivalents (FTE) totaling 402 for comparison across aquaculture activities and for comparison with Canadian aquaculture economic impacts. Some observations across activities include:

- **Hatcheries:** offer a mix of full-time, part-time, and seasonal work and these together represent 19% of all FTEs.
- **Finfish aquaculture:** offers mostly full-time work, does not rely on seasonal work, and represents 48% of all FTEs.
- **Shellfish aquaculture:** offers mostly seasonal work with a small number of owner/operators in full-time positions, and this represents 6% of all FTEs.
- **Processing:** offers a nearly equal split in full-time and part-time work, with a small amount on a seasonal basis, and this together represents 27% of all FTEs.
- **Supply services and other**: the supply services employment reported is small and is rolled into processing to protect confidentiality, and there are no figures reported for other activities.

The next series of graphs breaks out the employment findings according to types of aquaculture (e.g. hatcheries, grow-out, processing) and adds salaries along with an indication of associated product volume. The highlights are discussed below the tables.

Table 3.7: Aboriginal aquaculture survey hatchery jobs by species, 2014

Species	Pieces	FT	PT	Seasonal	Salaries
Salmon	12,120,000	5	-	3	266,667
Trout	-	-	-	-	-
Steelhead	-	-	-	-	-
Sea Cucumber	-	-	-	-	-
Mussel	-	-	-	-	-
Geoduck	-	-	-	-	-
Clam	NA	1	3	40	100,000
Scallop	-	-	-	-	-
Oyster	7,333,333	1	-	6	192,000
Other	NA	47	11	-	2,100,000
Total	19,453,333	55	13	49	2,658,667

Source: Gardner Pinfold Survey of Aboriginal Aquaculture, 2015 NA = Not available/ applicable.

Table 3.8: Aboriginal aquaculture survey finfish grow-out jobs by species, 2014

Species	Kg	FT	PT	Seasonal	Salaries
Salmon	93,333,333	113	19	-	5,340,000
Trout	3,866,667	41	13	-	1,400,000
Steelhead	733,333	11	5	-	400,000
Other Finfish1	-	11	-	-	320,000
Total	97,933,333	176	37	-	7,460,000

Source: Gardner Pinfold Survey of Aboriginal Aquaculture, 2015 NA = Not available/ applicable.

Table 3.9: Aboriginal aquaculture survey shellfish grow-out jobs by species, 2014

Species	Kg	FT	PT	Seasonal	Salaries
Sea Cucumber	-	-	-	-	-
Mussel	-	-	-	-	-
Geoduck	-	-	-	-	-
Clam	220,000	3	-	44	100,000
Scallop	-	-	-	-	-
Oyster	80,000	5	-	5	186,667
Sea urchin	-	-	-	-	-
Other1	-	-	-	-	-
Total	300,000	8	-	49	286,667

Source: Gardner Pinfold Survey of Aboriginal Aquaculture, 2015 NA = Not available/ applicable.

Table 3.10: Aboriginal aquaculture processing and supply services jobs by species, 2014

Species	Kg	FT	PT	Seasonal	Salaries
Salmon	53,433,333	53	7	4	2,270,667
Trout	-	-	-	-	-
Steelhead	622,667	-	32	-	293,333
Sea Cucumber	-	-	-	-	-
Mussel	480,000	-	16	-	115,200
Geoduck	-	-	-	-	-
Clam	-	-	-	3	6,667
Scallop	-	-	-	-	-
Oyster	-	-	-	3	6,667
Other*	80,000	18.67	15	-	556,800
Total	54,616,000	72	69	9	3,249,333

*Source: Gardner Pinfold Survey of Aboriginal Aquaculture, 2015 NA = Not available/ applicable. *Other category includes supply services to protect confidentiality of survey respondents.*

The following observations capture differences across types of aquaculture activity:

- **Hatcheries:** offer average salaries of $35,000 per FTE and represents about 20% of the income earned in Aboriginal aquaculture activities.
- **Finfish aquaculture:** offers average salaries of $38,000 per FTE and represents about 54% of the income earned in Aboriginal aquaculture activities.
- **Shellfish aquaculture:** offers average salaries of $13,000 per FTE and represent about 2% of the income earned in Aboriginal aquaculture activities.
- **Processing:** offers average salaries of $30,000 per FTE and represent about 24% of the income earned in Aboriginal aquaculture activities.
- **Supply services and other**: the supply services income is small and is rolled into processing to protect confidentiality, and there are no figures reported for other activities.

The average salary per direct FTE across all of Canadian aquaculture is $33,081 (from Table 3.3) therefore the above salaries appear to be on par with Canadian averages. The following shows how Aboriginal aquaculture activity is split almost equally between in direct and indirect aquaculture activities:

- **Direct:** The finfish and shellfish grow-out operations are considered direct aquaculture activities, and these together account for 217 FTE (54%) and $7.7 million of salaries (57%). Average direct aquaculture salaries are about $35,600 for Aboriginals compared to $33,081 for all Canadians.
- **Indirect:** The hatcheries, processing, and supply services are considered indirect aquaculture activities and these account for the balance 184 FTE (46%) and salaries totaling $5.9 million (43%). Average indirect aquaculture salaries are about $33,300 for Aboriginals compared to $50,667 for all Canadians. This may mean that Aboriginals are not as well represented in higher paying positions in hatcheries, processing, and supply services.

Economic impacts

The direct Aboriginal aquaculture employment and salary information is the starting point for estimating economic impacts. Using the following table of Canadian average economic impact multipliers on a per *direct* job basis, we build a picture of economic impacts for Aboriginal aquaculture in Canada.

Table 3.11: Average economic impact multipliers per direct job in Canada

($)	Output	GDP	Salaries	Jobs
Direct	191,069	60,809	33,081	1
Indirect	208,589	79,569	49,015	0.967
Induced	71,852	42,191	23,929	0.449
Total	**471,510**	**182,569**	**106,025**	**2.416**

Source: Statistics Canada Interprovincial input-output model.

This table signifies that for the 1 FTE job (top right cell) there are, for example, 0.967 indirect jobs and 0.449 induced jobs created. Similarly, for Output, GDP, and Salaries 1

direct job on average generates the other economic impacts shown. We now apply these multipliers to the direct Aboriginal jobs identified from the survey, with the only exception that the survey-based salaries will be used as the direct salaries, and generate the the economic impacts in the table below.

Table 3.12: Estimated Aboriginal aquaculture economic impacts, 2014

($)	Output	GDP	Salaries	Jobs
Direct	41,462,005	13,195,447	7,746,667	217
Indirect	45,263,862	17,266,468	10,636,314	210
Induced	15,591,793	9,155,479	5,192,585	97
Total	**102,317,660**	**39,617,394**	**23,007,399**	**524**

Source: Statistics Canada interprovincial input-output model and Gardner Pinfold survey of Aboriginal aquaculture in Canada.

The direct activities all relate to Aboriginal participants, and 185 of the indirect jobs and $5.9 million in corresponding salaries are captured by Aboriginals. Therefore, Aboriginal aquaculture participants account for 402 FTE jobs with salaries totaling $7.9 million. Some other key points are worth highlighting as follows:

- **Indirect impacts:** The indirect jobs reported in the survey (185) and their salaries ($5.9 million) are captured within the indirect jobs shown in the table (210) and the corresponding salaries ($10.6 million).
- **Spinoffs:** Aboriginal aquaculture is generating substantial spinoffs to the Canadian economy. Another 123 jobs are generated in the economy with additional salaries amounting to $9.3 million.
- **GDP:** About $39.6 million worth of added-value is linked to Aboriginal aquaculture in Canada.
- **Output:** The total sales associated with direct, indirect, and induced activity flowing from Aboriginal aquaculture in Canada is $102 million.

Aboriginal aquaculture economic impacts are very substantial in their own right and these are about 5.7% of all economic activity linked to aquaculture in Canada.

Aboriginal aquaculture development

Survey participants were asked a number of questions about how they are improving their aquaculture initiative and what are their most important issues. Answers are divided according to operational and planned aquaculture initiatives.

Table 3.13: What Aboriginal aquaculture developments are you pursuing, 2014

Strategies	Operational	Planning
Collaborating/partnering with non-aboriginal companies and/or individuals to develop aquaculture	42%	50%
Collaborating with other First Nation communities involved in aquaculture.	8%	20%
All other single responses*	50%	30%

Source: Gardner Pinfold Survey of Aboriginal Aquaculture, 2015

**Other responses include expanding to other species, other markets, conducting research, developing land-based grow-out, and other positive initiatives.*

Collaborating in general and specifically collaborating or partnering with non-Aboriginal companies and individuals is clearly a primary strategy, but there are some differences between operational and planning stages in aquaculture development:

- **Operational aquaculture**: 42% of these respondents identified collaborating and partnering with non-Aboriginal companies and individuals as their top strategy, but there were 50% identifying unique responses showing that the operational stage has a broader range of development strategies than at the start-up phase.
- **Planning aquaculture**: 70% of those in planning initiatives are focused primarily on collaboration: either collaborating and partnering with non-Aboriginal companies and individuals (50%), or collaborating with other First Nations (20%).

Part C. Growth potential

Canadian outlook – 5% annual growth with uncertainties

The historical path of aquaculture development in Canada underscores the need for caution in projecting future growth for the sector. Despite tremendous optimism through the 1990s and calls for doubling and tripling production through the 2000s, a number of factors have contributed to the leveling off in growth over the last decade.

Global growth slowing

Aquaculture emerged as an alternative to marine capture fisheries that showed global weakening in the mid 1980s (FAO, 2014) Although Canadian aquaculture growth stalled in the 2000s, global aquaculture production continued to grow. FAO reported global production from 1990 to 2012 increased 410% over this period. However, the rate of growth has been slowing from 18.6% average annual growth in the early 1990s down to 6.4% average annual growth in recent years. China is the dominant player having started with 49.6% of global aquaculture in 1990 and rising to 61.7% share by 2012. North America's share of global markets over this period declined from 2.7% to 0.9%.

Table 3.14: World aquaculture production and growth,1990 - 2012 (metric tonnes)

(mt)	1990	1995	2000	2005	2010	2012
Production	13,074,679	24,382,522	32,417,781	44,297,145	59,038,416	66,633,253
Growth to 2012	410%	173%	106%	50%	13%	0%
Annual growth	18.6%	10.2%	8.8%	7.2%	6.4%	

Source: FAO, 2014. The State of World Fisheries and Aquaculture.

Global supply competition

Global demand for aquaculture products is still expected to grow, especially with marine fisheries weakness for the foreseeable future. In order for Canada to gain from this it must compete with other well-established aquaculture countries for existing and expanding markets.

Canadian aquaculture production and viability is strongly influenced by development of aquaculture in other countries that have a profound effect on global prices. Canada does not account for a majority share of market supply for any of the main species it produces, including salmon in particular. Chile, for example, is a global leader in low-cost salmon production and is a key contributor to recent over-supply and depressed prices. The environmental requirements for siting aquaculture operations, low-cost labour, and wider range of therapeutants available for disease treatments all contribute to Chile's edge.

Aggressive international competition dampens Canadian investment in aquaculture and squeezes operator investment in labour both in terms of hiring and training (including Aboriginals). In response to global competition, Canadian companies have turned to consolidation (mergers and acquisitions) in the last decade to achieve greater economies of scale. This has reduced the number of employees and hiring, and accelerated investment in automated feed systems that further reduce labour requirements.

Unforeseen events

Unanticipated major disease outbreaks in Chile have had the positive effect of reducing global supply and lifting prices. This sustained or increased prices paid for Canadian product while markets waited for the return of Chilean production levels. This had the effect of increasing revenues, but not production since the sector cannot change operations quickly enough for such short-term market fluctuations. This has little or no benefit for jobs in Canada.

On the other hand, disease outbreaks in Canada have caused sudden drops in salmon production. This occurred in New Brunswick, and as recently as last year in Newfoundland and Labrador. There are a number of industry improvements aimed at improving the stability of supply. Bay management systems limiting successive year-classes in the same bay and mandatory fallowing of sites after harvest help in this regard. There is a call for access in Canada to a wider range of therapeutants and novel feeds for disease control that are already available to other competitors.

Limits to expansion

There is still room for many additional sites in near-shore areas, but this is not unlimited. New Brunswick is nearly fully subscribed for salmon sites. Nova Scotia just released new aquaculture regulations that will lift a moratorium on new development, but the Province is still expected to move cautiously. British Columbia and Newfoundland and Labrador offer the most extensive coastlines with potentially suitable sites, however there may be diminishing returns as expansion proceeds to more distant locations from processing facilities and transport networks.

Technology advances

Technological advancement means that more remote coastal areas, offshore locations, and land-based facilities still hold promise for expansion. Completely automated aquaculture sites with little need for on-site staff are being developed. Land-based closed-containment systems are also being developed, but these technologies have yet to be adopted commercially on a wide-spread basis. Their increased capital costs must be offset by operational advantages, market premiums for environmental benefits, or public support in the early years of implementation. Indeed, First Nations (e.g. Namgis / Kuterra) are already engaged in this land-based production as it better reflects their sustainable development aims. Keep in mind some of these technologies offer little by way of employment and primarily opportunities for investment in capital.

Alternative species priorities

Canada may be well-positioned to develop aquaculture for other species, particularly if these initially capture a premium in niche markets. On the west coast Sablefish, Geoduck, Mussels, and Scallops are considered priority species, freshwater opportunities include Arctic Charr, Sturgeon, Walleye/Perch, and east coast priorities include Halibut, Atlantic cod, Wolf fish, Bay scallops, Giant scallops, and Soft-shell clams. (DFO, 2009)
These also take time to commercialize and longer still to grow substantially before having an impact on the national picture.

Currency exchange improving

Flattening of Canadian aquaculture growth in the 2000s overlapped with the financial crisis in the U.S. and near historic highs for the Canadian dollar (above par with the U.S.). Since the U.S. is the major market for Canadian aquaculture this certainly played into U.S. buyers sourcing from low-cost producers. As the U.S. economy has recovered the U.S. Federal Reserve is raising interest rates for the first time in almost a decade, and the economy is considered at full-employment levels. Strengthening U.S. consumer demand combined with a return to the lowest Canadian dollar in eleven years ($0.72 U.S.) are extremely welcome developments for food producers and processors in Canada.

Senate outlook

The Standing Senate Committee on Fisheries and Oceans just released a comprehensive report with the primary focus on regulatory improvement in Canada. The report calls for a national aquaculture act in an effort to simplify and improve regulation of aquaculture. This is believed to be a significant barrier to strong aquaculture growth in Canada.

The Senate report also stands as the most credible and recent source of projected national aquaculture growth potential. The authors support the Canadian Aquaculture Industry Association (CAIA) estimate that Canada could double production in the next ten years for both finfish and shellfish. CAIA's estimate is based on the following assumptions:

- "an average annual production growth of 5% achieved through productivity improvements at existing aquaculture sites during the first five years; and,
- an average annual production growth of 10% during the following five years, achieved through a 38% increase in new sites." (Senate, 2015)

These projections may assume favourable conditions over the next decade.

Aboriginal outlook – 16% annual growth, with challenges

Aboriginal aquaculture may follow national trends, but it also has the potential to develop on its own path. If Canadian aquaculture continues to stagnate, Aboriginal aquaculture can still grow as a result of unique opportunities. Projecting Aboriginal aquaculture potential must begin with the insights of operators and planners that know best what opportunities are within their reach.

Participants with operational aquaculture sites were asked if they expect to be growing, declining, stable, or uncertain over the next three years. Of those that responded, 50% indicated they expect up to 25% growth, another 38% expect 26-50% growth, and 13% of operators expect over 50% growth in three years. None of the respondents indicated stable or declining operations over the next three years.

More specifically, respondents were asked how many full-time jobs they are expecting to add as a result of growth over the next three years. The responses are broken down according to operational and planning initiatives:

- **Operational aquaculture**: Those with existing operations indicated 149 new jobs are anticipated in the next three years. This is a three-year total increase of 37% or an annual straight-line increase of 12%.
- **Planning aquaculture**: based on the survey those with planned aquaculture developments are anticipating 48 new jobs. This is a three-year total increase of 12% or an annual straight-line increase of 4%. Those with planned operations did not all respond to this question, likely reflecting a greater degree of uncertainty about labour requirements in the planning stages.

The average rate of growth combining operational and planning additions to employment would be 16% per year. At these rates the following five-year and ten-year employment gains are possible:

- **New direct and indirect jobs:** 441 in 5 years, and 881 in 10 years
- **New direct and indirect FTE:** 329 in 5 years, and 658 in 10 years

Other economic impacts would arise in proportion to these employment gains. Again there are recognized challenges (below) therefore cautious optimism is warranted.

Growth challenges

Operator and planner insights

In efforts to grow aquaculture there are a range of key challenges and issues. Survey participants assigned a score from 0 to 100 showing the importance of each one below.

Table 3.16: How important are each of the following issues (0-100 score)?

Challenge/Issue	Operating Score	Planning Score
Qualified employees	81	79
Access to financing	80	87
Community support for aquaculture development	68	72
Understanding of aquaculture business/operations	65	71
Government policy	65	64
Access to suitable sites	56	73
Access to leases/licences	54	65
Environment change (e.g. climate, acidification, contaminant, disease)	50	66
Access to inputs (e.g. seed)	45	63
Training, please specify:	24	21
Other	19	14

Source: Gardner Pinfold Survey of Aboriginal Aquaculture in Canada, 2015
Note: Respondents could assign 0 to 100 scores for each issue.

The top two challenges for operating initiatives are qualified employees (average score of 87), and access to financing. Not surprisingly, the top score for planning initiatives is access to financing (87) then securing qualified employees.

Some respondents gave relatively consistent scores across issues so pressing them to rank their most important issues can help to distinguish issues further. In this case (Table

below) three points are assigned to a top rank, two points to the second rank, and 1 point to the third ranked item for each respondent.

Table 3.17: Rank each of the following issues in order of importance

Challenge/Issue	Operating Score	Planning Score
Access to financing	25	30
Understanding of aquaculture business/operations	13	4
Access to leases/licences	11	8
Access to suitable sites	11	7
Qualified employees	8	7
Government policy	6	3
Community support for aquaculture development	5	7
Training, please specify:	4	0
Environment change (e.g. climate, acidification, contaminant, disease)	0	4
Access to inputs (e.g. seed)	0	1
Other	0	6

Source: Gardner Pinfold Survey of Aboriginal Aquaculture in Canada, 2015
Note: 3 points assigned for top rank, 2 points for second rank, 1 point for third.

The ranking of challenges and issues adds clarity as follows:

- **Top issue**: Access to financing rises clearly to top spot for both operating and planned aquaculture developments.
- **Second issue**: Understanding aquaculture business and operations was second for operators, while access to leases and licences was second for planning.

This may be used as a guide to help the greatest number of Aboriginal aquaculture initiatives with their most pressing issues.

Other in-depth analysis

Previous work commissioned by the Aboriginal Aquaculture Association for Improving Access to Aquatic Resources for First Nations (Aquametrix), provides a more thorough review of issues. The issues are organized according to the following key topics:

- Access to sites
- Tenure application process
- Policy and/or regulatory constraints
- Access to working capital
- Training capacity, and
- First Nation Community Issues

There is some overlap in the priority issues reported by survey respondents and the issues covered in this report. Perhaps more importantly the previous research turns to recommended solutions for improving access:

- **Identifying the opportunity** – First Nations taking a lead role in identifying sites and species that could be developed within their territories. This would involve resource inventories and formalizing aquaculture development opportunities.
- **Managing the opportunity** – Developing an aquatic resources management framework, aquaculture operations agreements with aquaculture proponents.
- **Working effectively with governments** – Co-management arrangements with federal/provincial governments and mechanisms for revenue sharing to maintain oversight functions.
- **Development capacity** – Development support services including a specific Aquaculture Development Centre, access to working capital, specialized training capacity, resolution of development and operational constraints primarily related to shellfish issues.

Positive and negative community impacts

Sometimes open-ended questions are the best and only means for other views and information to be expressed so this opportunity was provided at the end of the survey. Survey participants were asked to identify any other positive or negative observations with respect to aquaculture in their community. The following represents a summary of responses and some interesting remarks according to planned and operating aquaculture developments. The detailed responses are also included in the Appendix to make sure there is no loss of the intended messages from respondents.

Planning

- **Positives:** Income, employment, skill development, and community revenue/support are the most common **economic benefits** mentioned. Self-esteem, pride, healthier lifestyles, and creating a sense of belonging are the most common personal and **social benefits** cited. Reducing pressure on wild fish stocks, and developing sustainable containment aquaculture alternatives are mentioned as **environmental benefits**.

- **Negatives:** **Environmental concerns** are the most common response including potential effects to water quality, existing wild fish stocks, and ecosystems generally. **Social concerns** include community tension, differing viewpoints, lack of information and confusion about information concerning aquaculture is common. **Economic concerns** are specific to starting-up aquaculture, the lack of capital and costs associated with meeting regulatory requirements is a concern.

Operating

- **Positives:** The same positives from planning respondents are repeated by operational respondents, however some other ideas are added. There is more of **youth benefits** including a sense of purpose, a means to stay close to family for support, and securing opportunities for future generations. **Cultural benefits** are mentioned such as bringing back the lost or fading art of processing and smoking local seafood. Finally, there is a sense of **re-establishing community control of resources** in their traditional territory.

- **Negatives:** The negatives mentioned by operators focus more on aquaculture itself than on aquaculture's effects on other things. For instance, it is **difficult to make a living** when regulations are too demanding, and aquaculture generally does not provide enough jobs. **Training improvement** is needed for aquaculture jobs since training can be stressful for Aboriginals that have negative experiences and perceptions of education. At the same time, not providing enough support to get proper training puts Aboriginals in a poor position on the job if they feel inadequate.

IV

CONCLUSION

Canadian aquaculture

Production and value of aquaculture in Canada has remained relatively stable over the last decade. Total farm-gate value of output in 2014 stood at $733 million from 134,583 metric tonnes of product.

Economic impacts including direct, indirect, and induced activities result in $1.8 billion worth of sales, $701 million in added-value (GDP), of which $407 million is income captured through about 9,300 full-time equivalent jobs.

Average salaries across direct aquaculture activities in Canada are $33,081, and for indirect activities they rise to $50,667. Indirect activities include hatcheries, processing, feed producers, transport, and other supplies and services.

Aboriginal aquaculture

The value of output for Aboriginal aquaculture is estimated based on survey findings and average relationships between employment, incomes, and output in Canada. Total farm-gate value of output is estimated at $41 million, of which $13 million is added-value (GDP), and $7.7 million is earned incomes through 217 full-time equivalent jobs.

Economic impacts including direct, indirect, and induced activities result in $102 million worth of sales, $40 million in added-value (GDP), of which $23 million is income captured through about 524 full-time equivalent jobs. These represent about 6% of the Canadian totals.

Average salaries across direct Aboriginal aquaculture activities in Canada are $35,600, and for indirect activities they rise to $33,300. The direct salaries are on par with national averages while the indirect salaries are lower than Canadian averages. The lower salaries may indicate that Aboriginals are not as well represented in higher paying positions in hatcheries, processing, and supply services.

Growth outlook

Canadian outlooks for growth (e.g. Senate report) support 5% average annual growth in the next 5-10 years. This may rely on favourable conditions, while there are a number of uncertainties regarding aquaculture development.

- **Negative factors**: Global aquaculture growth has been slowing, international low-cost competition is driving markets, domestic disease issues may arise again, and there are limited opportunities for expansion in some parts of Canada.

- **Positive factors**: Technology advances may prove land-based and/or more distant marine sites can be commercially-scaled, disease outbreaks for competitors can improve world prices, alternative species may be developed commercially, increasing consumer attention to sustainability, food safety and traceability, and improved currency exchange with the U.S. are all good for Canada.

Aboriginal aquaculture outlooks for growth are based on survey findings according to operators and planners. All respondents expect at least some growth moving forward:

- **Operators:** Anticipate average annual growth rates of 12%, or 149 new Aboriginal jobs in the next 3 years.

- **Planners:** Indicate average annual growth of 4% resulting in 48 new Aboriginal jobs in the next 3 years.

- **Combined:** This signifies potential for 441 and 881 Aboriginal jobs in 5 and 10 years respectively. This is equivalent to 329 and 658 full-time equivalent jobs added in 5 and 10 years respectively.

Other economic impacts would arise in proportion to these employment gains. As for Canada overall there are recognized challenges, some particular to Aboriginal development, therefore cautious optimism is warranted.

The top challenge facing Aboriginals in both operational and planning initiatives is access to financing. Other top issues include securing qualified employees, understanding aquaculture business and operations, and access to leases and licences.

There is potential for Aboriginal aquaculture to out-perform Canadian growth overall due to unique opportunities for Aboriginals. Addressing the barriers to Canadian aquaculture generally and for Aboriginal participation in particular will lead to realizing the growth and community development that many are working toward.

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SURVEY INSTRUMENT

Q1 This survey is being conducted by Gardner Pinfold Consultants Inc. (GP) on behalf of the Waubetek Business Development Corporation for the Aboriginal Aquaculture Initiative in Canada. Waubetek representatives may be contacted for more information.

The objective of this survey is to describe the current status of Aboriginal participation in the Canadian aquaculture sector. The levels of participation, production, and community benefits will be compared to overall aquaculture development in Canada and tracked in the future to measure changes.

The responses to this survey are being collected by Gardner Pinfold, a professional research firm in Canada. The firm adheres to strict standards of privacy and confidentiality. Please note that information about individuals is not required so private information remains strictly confidential and anonymous in the final report resulting from this research. Your name or any other personal identifying information will not be reported.

Q2 This survey is directed to both Aboriginal participants in aquaculture and non-Aboriginals involved in aquaculture (e.g. human resource staff in companies with Aboriginal employees). Please complete the survey questions that are applicable from your perspective. In case we need to follow-up with you after the survey, please provide the following background information.

What is your name?

Q3 What is your phone number (please include area code)?

Q4 What is your First Nation or organization that you represent, if applicable?

Q5 Are you involved in currently active aquaculture-related activities (generating revenues now)?

- ❍ Yes
- ❍ No, but planning for future operations.

Q6 If you do not have active aquaculture activities to report on, please continue the survey based on your projections of aquaculture activities you will be involved with (best estimates).

Q7 What aquaculture companies or initiatives are you involved with, if applicable?

Company/initiative 1
Company/initiative 2
Company/initiative 3

Q8 What is your role or title?

Q9 Please provide the location(s) where aquaculture activity involves aboriginals that you are familiar with?

Q10 Please read this carefully:

- **You may skip questions** that do not apply to your aquaculture company or initiative.
- **Reporting year**: All answers in this survey should be based on the last year of available information (e.g. 2014).
- **Types of aquaculture**: Tables are presented separately for hatchery, finfish grow-out, shellfish grow-out, processing, supply and service activities.
- **Avoid double-counting**: Please do not enter information twice for output, employees, or total salaries in this table or across tables.
- **Multi-species aquaculture** operations may have workers responsible for more than one species so in the following questions please indicate their main responsibility or estimate how their time is divided by species.
- **Full-time staff** working full-time (e.g. 40 hours) all year should each be entered as 1. Part-time staff working one day per week for a full year should each be entered as 0.2 (i.e. two days a week is 0.4, three days a week is 0.6 and so on). Seasonal staff working full-time for three months of the year are each entered as 0.25 (i.e. 6 months full-time is 0.5 and so on).

What hatchery products are Aboriginals involved in (include finfish and shellfish eggs, juveniles, and adults)?

	Numbers (pieces)	Full-time staff	Part-time staff	Seasonal staff	Total salaries ($)
Salmon					
Trout					
Steelhead					
Sea cucumber					
Mussel					
Geoduck					
Clam					
Scallop					
Oyster					
Other, specify:					
Other, specify:					
Other, specify:					

Q11 What finfish grow-out products are Aboriginals involved in?

	Output (kg)	Full-time staff	Part-time staff	Seasonal staff	Total salaries ($)
Salmon					
Trout					
Steelhead					
Other, specify:					
Other, specify:					
Other, specify:					

Q12 What shellfish products are Aboriginals involved in?

	Output (kg)	Full-time staff	Part-time staff	Seasonal staff	Total salaries ($)
Sea cucumber					
Mussel					
Geoduck					
Clam					
Scallop					
Oyster					
Sea urchin					
Other, specify:					
Other, specify:					
Other, specify:					

Q13 What processing products are Aboriginals involved in?

	Output (kg)	Full-time staff	Part-time staff	Seasonal staff	Total salaries ($)
Salmon					
Trout					
Steelhead					
Sea cucumber					
Mussel					
Geoduck					
Clam					
Scallop					
Oyster					
Other, specify:					
Other, specify:					
Other, specify:					

Q14 What supply and service products are Aboriginals involved in?

	Full-time staff	Part-time staff	Seasonal staff	Wages and salaries ($)
Nets and rigging				
Cages				
Feed production				
Transport				
Sales and marketing				
Other manufacturing, specify:				
Technical,specify:				
Training, specify:				
Other, specify:				
Other, specify:				
Other, specify:				

Q15 For each type of aquaculture that Aboriginals are involved in, how many employees are in each of the following roles/positions? For reference:

- **Entry Level** (e.g., entry level site worker, entry level technician, fish farm helper, mussel farm labourer, mussel farm harvester, sea farm attendant)
- **Experienced** (e.g., site worker, technician, aquaculture technician, sea farm worker)
- **Specialized** (e.g., production and environmental researcher/scientist, fish health technician)
- **Supervisory** (e.g., aquaculture supervisor, lead hand, farm supervisor)
- **Management** (e.g., fish hatchery manager, site manager, aquaculture manager, farm manager)
- **Owner/Operator** (e.g., farm owner, farm operator)

	Entry Level	Experienced	Specialized	Supervisory	Management	Owner/Operator
Hatchery						
Finfish grow-out						
Shellfish grow-out						
Processing						
Supply and service						
Other, specify:						

Q16 Please indicate which of the following other related aquaculture development activities Aboriginals are involved in:

- Operating/developing land-based grow-out production (not hatchery).
- Collaborating/partnering with non-aboriginal companies and/or individuals to develop aquaculture.
- Collaborating with other First Nation communities involved in aquaculture.
- Working/collaborating on research to advance aquaculture.
- Expanding service and supply products.
- Developing aquaculture with different species, please specify: _____
- Expanding sales to new markets, please specify: _____
- Other positive initiatives, please specify: _____

Q17 What is the three-year outlook for your aquaculture company or initiative?

Hatchery	❍ Decline	❍ Stable	❍ Growing	❍ Not sure	❍ Not applicable
Grow-out	❍	❍	❍	❍	❍
Processing	❍	❍	❍	❍	❍
Shellfish	❍	❍	❍	❍	❍
Supply and service	❍	❍	❍	❍	❍

Q18 You indicated the three-year outlook is uncertain, can you briefly describe why?

Q19 You indicated that you expect change in the next three years, can you answer the following?

Estimate percentage change (please include + or - sign for growth or decline)
Estimate number of full-time jobs affected (please include + or - sign for growth or decline)

Q20 Please indicate the importance of the following potential aquaculture development barriers to growth for your First Nation (even if growing indicate any barriers to greater/faster growth): Move the slider bar to indicate the importance of each topic (left or 0 is not at all important, and right 100 is extremely important).

_____ Access to financing
_____ Access to leases/licences
_____ Access to suitable sites
_____ Understanding of aquaculture business/operations
_____ Qualified employees
_____ Community support for aquaculture development
_____ Changing environment (climate, acidification, contaminants, diseases etc.)
_____ Access to inputs (e.g. seed)
_____ Government policy
_____ Training, please specify:
_____ Other, please specify:

Q21 You indicated the following topics are more important. Could you please rank these where 1 is most important?

Q22 Please indicate any other positive benefits of aquaculture development involving Aboriginals that may be difficult to measure (e.g. greater self-esteem, contributions to community programs, improved quality of life).

Q23 Please indicate any other negative impacts of aquaculture involving Aboriginals that may be difficult to measure (e.g. community tension, stress on individuals or families).

COMMUNITY POSITIVES AND NEGATIVES

Only minor edits of the actual survey responses have been made to improve readability and to protect the identity of respondents.

Planning positives

- Being on the water fishing is part of the Aboriginal way of life. Aquaculture will help to alleviate the strain on wild population, balancing the natural state, improve self esteem, contribute to the local economy and improve quality of life. Experienced fishers and leaseholders will teach the youth.
- Involvement in a contained aquaculture system will promote pride that we are doing aquaculture differently. Employment for community members always raises everyone's self esteem. If we are successful, the entire community will have a sense of pride on a revenue generating project that is environmentally friendly.
- Greater self-esteem, pride in the work, sense of belonging to a community project, job creations, promotion of healthy food and diet, contribution to community programs, etc.
- Massive increase in employment/ and spinoffs
- Employment in locations that may be otherwise economically depressed / growth of one segment of the industry makes room for other segments to begin to open more locally (i.e. if growth sites increase there will be room for a hatchery to spring up)
- Job Readiness, Skill Development, Long Term Employment, etc.
- Financial contribution to community / Pride in sustainable development project
- New source of income that has not been accessed
- There is a need to diversify the local economy with shellfish and the Local Gathering Initiative utilizing licences.
- This is a pilot project for the food industry in North America. / the benefits could take the stress off the commercial fishing industry

Planning negatives

- Potential impact on the environment, but this can easily be mitigated through proper husbandry practices.
- There will be those in the community that will be opposed to any kind of aquaculture and will make sure their opinions are heard! Environmental organizations seem to always have an opinion as well and may confuse facts for others.
- There will be a need to ensure no negative impact on the environment, on water quality, on existing wild stocks.
- Community support is necessary!
- Lack of prior and informed consent
- Lack of awareness
- Community tension / differing viewpoints between individuals
- Environmental

- Transport Canada has changed regulations for setting up buoys to mark the aquaculture sites. The buoys are very expensive. Our previous mussel farm project failed and therefore there is a large amount of equipment remaining in the water. Transport Canada has mandated that we clean the aquaculture site otherwise we may lose access to the leased sites. We had difficulty finding a diver and vessel to perform the cleaning.
- Access to capital for individuals to start own business so there is a need to create shellfish model and it will snowball.

Operating positives

- Job creation and financial contribution to the band once we start making money
- Bring jobs, training & income to communities
- Aquaculture represents a chance for members to participate in gainful employment that also has culture significance.
- Purpose for young adults, opportunities to excel resulting in positive change in all areas of life.
- All the above is definitely positive to all our employees. In our community it also is bringing back some of the lost or fading art of processing and smoking our local seafood to the youth in our native communities that do not have opportunities to experience and learn the traditional ways.
- Aquaculture allows successful local business leaders to demonstrate by example what is involved in running a successful business. These people become leaders and mentors within the community which I believe is ultimately the most important outcome. The young people then have people to model themselves after. Of course greater self-esteem, improved quality of life are outcomes but it will be self perpetuating not just short term. Males learn differently than females whether on or off a reserve. Many males need to like what they are doing to have real interest. Aquaculture can do this.
- Aquaculture can provide a framework for many programs that enhance the individual and the community. An individual that has a job can feel they are achieving something and have a purpose. Aquaculture can be a community venture where people join in the work and the benefits creating a heighten sense of community. Aquaculture businesses can provide financial benefits to the community plus fresh seafood for a healthier lifestyle. Aquaculture businesses near the community can keep young people at home where they have family support.
- Merging with our commercial fishing operations, gear and processing sector. Improved future vision and career opportunities which improve self esteem, emotional and physical health.
- The largest benefit is for the nation's ability to be able to re-establish its management of the marine resources within its traditional territory. For the First Nation's aquaculture program its about ensuring that economic opportunities are secured for future generations.
- Increased skill set for individuals, improved socio-economic conditions on reserve, more employment opportunities

Operating negatives

- Not enough jobs
- Treated like a business family or workers must keep close relations to work, personal & family matters to make sure there is an equal part placed for growth in their business holding interest at all times.
- The DFO regulations have made it incredibly challenging for our members to earn a living from the sea. They have allowed the environment and fish stocks to be damaged and depleted such that even aboriginal constitutional rights to fish are heavily limited.
- There are no negative impacts in our community to aquaculture involvement
- Many First Nations do not have good memories of school and putting them into a regular training program is very stressful for them. If the community and/or family does not provide support and have a good understanding of the responsibilities of an employee, it is difficult for the employee to meet their obligations especially when their acquaintances and family are encouraging them to do other things. Members of some communities do not have the necessary basic skills to undertake even entry jobs and putting them into these positions without continued support and assistance is harmful to their self esteem - and who can do a good job when they feel in adequate? Employment in general is not always attractive to someone who has not had to be employed previously. The incentive for working needs to provide the reasons to overcome the barriers in order to ensure commitment over the long term and eventual realization of the potential good aquaculture can provide to the individual. These are not insurmountable issues but they can not be ignored.
- We haven't experienced any negative community impacts to date.