

VOLUME ONE – AQUACULTURE INDUSTRY AND GOVERNANCE IN CANADA

Standing Senate Committee on Fisheries and Oceans

*The Honourable Fabian Manning
Chair*

*The Honourable Elizabeth Hubley
Deputy Chair*

June 2016



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ORDER OF REFERENCE

Extract from the *Journals of the Senate*,
Monday, December 9, 2013:

The Honourable Senator Manning moved,
seconded by the Honourable Senator Unger:

That the Standing Senate Committee on
Fisheries and Oceans be authorized to examine
and report on the regulation of aquaculture,
current challenges and future prospects for the
industry in Canada;

That the papers and evidence received and taken
and work accomplished by the committee on this
subject during the First Session of the Forty-first
Parliament be referred to the committee; and

That the committee report from time to time to
the Senate, but no later than June 30, 2015, and
that the committee retain all powers necessary to
publicize its findings for 180 days after the tabling
of the final report.

The question being put on the motion, it was
adopted.

Gary W. O'Brien
Clerk of the Senate

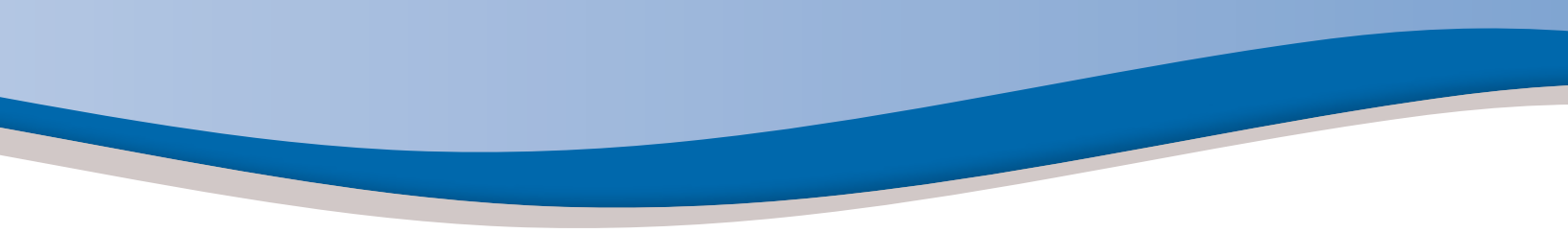


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LIST OF ACRONYMS

AAR:	Aquaculture Activities Regulations	IHN:	Infectious Hematopoietic Necrosis
AIS:	Aquatic Invasive Species	IPMP:	Integrated Pest Management Program (New Brunswick)
ALMB:	Aquaculture Leasing Management Board (Prince Edward Island)	ISA:	Infectious Salmon Anaemia
AMAC:	Aquaculture Management Advisory Committee (British Columbia)	IMTA:	Integrated Multi-Trophic Aquaculture
ASERC:	Aquaculture Site Environmental Review Committee (New Brunswick)	LRC:	Aquaculture Leasing Referral Committee (Prince Edward Island)
B.C.:	British Columbia	MAPAQ:	Québec Department of Agriculture, Fisheries and Food
BCARP:	British Columbia Aquaculture Regulatory Program	MOU:	Memorandum of Understanding
BC-FLNRO:	British Columbia Ministry of Forests, Lands and Natural Resource Operations	NASAPI:	National Aquaculture Strategic Action Plan Initiative
BC-MA:	British Columbia Ministry of Agriculture	N.B.:	New Brunswick
BMA:	Bay Management Area	NB-DAAF:	New Brunswick Department of Agriculture, Aquaculture and Fisheries
CCFAM:	Canadian Council of Fisheries and Aquaculture Ministers	NB-DELG:	New Brunswick Department of Environment and Local Government
CFIA:	Canadian Food Inspection Agency	N.L.:	Newfoundland and Labrador
CSSP:	Canadian Shellfish Sanitation Program	NL-DFA:	Newfoundland and Labrador Department of Fisheries and Aquaculture
DFO:	Department of Fisheries and Oceans Canada	N.S.:	Nova Scotia
EIA:	Environmental Impact Assessment	NS-DFA:	Nova Scotia Department of Fisheries and Aquaculture
EMP:	Environmental Management Program (New Brunswick and Nova Scotia)	P.E.I.:	Prince Edward Island
FTE:	Full-Time Equivalent		
GDP:	Gross Domestic Product		

PEIAA:	Prince Edward Island Aquaculture Alliance
PEI-FARD:	Prince Edward Island Department of Fisheries, Aquaculture and Rural Development
PMRA: Agency	Pest Management Regulatory Agency
QC:	Québec
SAECOP:	Shellfish Aquaculture Environmental Code of Practice (Prince Edward Island)
SAP:	Sustainable Aquaculture Program (Federal Government)
SODIM:	Société de développement de l'industrie maricole inc. (Québec)
SOP:	Standard Operating Practices (New Brunswick)

INTRODUCTION

In January 2014, the Standing Senate Committee on Fisheries and Oceans (the Committee) began a study on aquaculture pursuant to an order of reference received from the Senate which reads as follows:

That the Standing Senate Committee on Fisheries and Oceans be authorized to examine and report on the regulation of aquaculture, current challenges and future prospects for the industry in Canada.¹

In response to this broad and complex mandate, the Committee decided to hold public hearings in Ottawa and to undertake fact-finding missions both within and outside of Canada. Within Canada, the Committee completed site visits in the provinces where the marine aquaculture sector operates: British Columbia (B.C.), New Brunswick (N.B.), Newfoundland and Labrador (N.L.), Nova Scotia (N.S.), Prince Edward Island (P.E.I.), and Québec (QC). As part of these missions, the Committee also took the opportunity to hold public hearings in some cities, including: Gander (N.L.), Halifax (N.S.), Moncton (N.B.), and Nanaimo (B.C.). International fact-finding missions brought the Committee to Norway and Scotland, two countries with aquaculture regulatory regimes comparable to Canada's.

This document constitutes Volume One in a series of three volumes the Committee has prepared on this study. In this volume, the Committee provides a brief profile of the aquaculture industry and its governance in Canada. Volume Two will present a profile of the industry in Norway and Scotland and

highlight how aquaculture is regulated in these jurisdictions. The information contained in Volume One and Volume Two is based, in large part, on background material gathered in preparation for the Committee's fact-finding missions. Volume Three will include the Committee's observations and recommendations on the aquaculture industry and its governance in Canada, based on findings from the fact-finding missions and the evidence gathered during the public hearings.

This volume is divided into eight chapters. Chapter 1 presents a general overview of the federal and provincial governance of aquaculture in Canada. Chapters 2 through 7 provide a portrait of the industry in B.C., N.B., N.L., N.S., P.E.I. and QC, and describe the framework in place in each province regulating aquaculture. Chapter 8 examines the economic repercussions generated by aquaculture and highlights some of the opportunities and challenges facing the industry in Canada.

The purpose of Volume One is not to compare the performance of the aquaculture industry from one province to the other, nor is it to assess the effectiveness or comprehensiveness of the federal and provincial regulatory frameworks. Rather, it is to better understand the diversity of the industry across the country and to examine the complexity of its governance, with a view to better define the roles and responsibilities of the federal government in relation to aquaculture.

CHAPTER 1: Overview of the Federal and Provincial Regulatory Framework

1.1 Setting the Context

In Canada, federal and provincial governments share regulatory authority over aquaculture – from siting, design and operation through to decommissioning. As will be explained in more detail in the other chapters, the provincial governments in N.B., N.L., N.S., and QC are the principal regulators responsible for aquaculture licensing and a system of tenure (or lease) management; bilateral Memorandums of Understanding (MOUs) on aquaculture development between the federal government and individual provinces serve to clarify the roles and responsibilities of each level of government. In P.E.I., responsibility for aquaculture leasing has been delegated to the federal government since 1928 and the industry is subject to co-management. In B.C., the federal government has been responsible for the operational regulation of aquaculture, including licensing, site approvals, and establishing operator requirements since 2010 as a result of a court decision, but the province remains responsible for issuing leases. Aquaculture governance in Canada is complex, not only because it involves two levels of government in each jurisdiction, but also because it involves several departments and agencies from each level of government. Even the division of roles and responsibilities between the federal government and the provinces varies from one jurisdiction to another as a result of the different provisions in each MOU.

Additionally, aquaculture development may involve the participation of municipal governments in public consultations and community engagement for proposed aquaculture operations. First Nations and other Aboriginal groups may be involved

as well during aquaculture licensing and review processes, consistent with legal obligations and the federal duty to consult.

1.2 Federal Departments and Agencies Involved in Aquaculture

At the federal level, the aquaculture industry is essentially regulated through seven distinct departments and agencies, involving at least twelve different but intertwined pieces of legislation and several related regulations. None of these statutes were designed to address aquaculture specifically, but some of their provisions do apply to the industry.

The Department of Fisheries and Oceans Canada (DFO) is the lead federal department responsible for aquaculture management. This responsibility was first assigned to the department by the Prime Minister in 1984 and was reaffirmed over the years. DFO assumes this lead role by ensuring that aquaculture is managed sustainably across the country in a way that protects fish and fish habitat as per the *Fisheries Act*. To improve clarity and transparency in the application of this Act to the aquaculture industry, DFO has developed the proposed *Aquaculture Activities Regulations* (AAR), which set out the conditions under which aquaculture operations can be conducted across the country.² Pursuant to the *Fisheries Act*, the department also manages aquaculture operations in P.E.I. and administers the *Pacific Aquaculture Regulations*, which govern aquaculture in B.C. In addition, DFO manages the federal government's Sustainable Aquaculture Program (SAP), which

has a strong focus on science and aims to enhance the sustainable development of the industry. The department also leads the development of plans for the integrated management of activities affecting estuaries, coastal and marine waters, and the coordination of oceans issues, as per the *Oceans Act*. Finally, DFO is responsible for aquatic species under the *Species at Risk Act*.

Environment Canada is responsible for minimizing threats to Canadians and the environment from pollution, including water pollution, under the *Canadian Environmental Protection Act*. As such, the department sets standards for triggering mandatory environmental risk assessments of substances identified in a number of acts and regulations, including the disposal at sea provisions of the *Fisheries Act* and the *New Substances Notification Regulations*.

Health Canada regulates drugs to ensure their safety for humans and animals under the *Food and Drugs Act*, including veterinary drugs administered to aquacultured fish. The department is also responsible for setting maximum levels for chemical contaminants in food, including those that can be found in fish and seafood, both captured and aquacultured. Similarly, the Pest Management Regulatory Agency (PMRA) regulates and registers pest control products under the *Pest Control Products Act*, including those used in aquaculture (to manage sea lice, for example). The AAR proposed by DFO are intended to clarify the conditions under which veterinary drugs and pest control products may be used in aquaculture and place reporting requirements on the use of these products.

The Canadian Food Inspection Agency (CFIA) manages and controls animal diseases – including diseases affecting finfish, molluscs, and crustaceans – under the *Health of Animals Act*; also under this Act, the CFIA can provide financial compensation to aquaculture facilities for the cost associated with the ordered destruction of animals – both those raised on land and in bodies of water – in response to outbreaks of reportable diseases. The CFIA further governs the manufacture and sale of livestock feeds under the *Feeds Act*, including fish feed. It also inspects processing plants and issues export certificates under the *Safe Food for Canadians Act*. Under the *Fish Inspection Regulations*, the CFIA ensures that all fish – aquacultured or wild caught – processed at federally registered establishments meet regulated requirements for safety, wholesomeness and identity. Moreover, the CFIA administers the Canadian Shellfish Sanitation Program (CSSP), jointly with DFO and Environment Canada. As part of the CSSP, the CFIA maintains a biotoxin surveillance program of shellfish aquaculture sites across the country.

Transport Canada is responsible for reviewing and approving applications for the placement of aquaculture containment and/or structures within the navigable waters of Canada; this is done to protect public rights of navigation under the *Navigation Protection Act*. The department also regulates vessel-related pollution prevention and response, vessel requirements and inspections, and vessel personnel and safety under the *Canada Shipping Act*.

Finally, under the *Department of Agriculture and Agri-Food Act*, Agriculture and Agri-Food Canada supports seafood market development and traceability initiatives, including initiatives for fresh and processed aquacultured products.

The fact that several federal departments and agencies are involved in the management of aquaculture reflects the cross-disciplinary nature of the industry. However, this leads to overlap and duplication in regulations, as well as in monitoring and compliance activities. For many years, the industry has called for a single national aquaculture statute that would reduce duplication, allow consistent oversight and harmonize the federal regulatory instruments.

1.3 Federal and Provincial Collaboration

In addition to the federal departments and agencies mentioned above, there are other ministries and agencies directly involved in the regulation and support of aquaculture in each province. In total, there are more than 70 pieces of federal and provincial legislation governing aquaculture in Canada. The Canadian Council of Fisheries and Aquaculture Ministers (CCFAM) is currently working to address a number of challenges associated with Canadian aquaculture governance. This work is carried out as part of the National Aquaculture Strategic Action Plan Initiative (NASAPI), a federal/provincial approach to ensuring the sustainable development of the aquaculture industry in Canada³.

CHAPTER 2: British Columbia

2.1 Profile of the Industry

2.1.1 Structure and Location

The aquaculture industry in B.C. comprises essentially two sectors: finfish and shellfish. The structure of the finfish sector has changed significantly over the years as a result of consolidation and integration. While there were some 100 companies active in the sector in the 1980s, there are now only 11 left, with three of them – Marine Harvest, Cermaq and Grieg Seafood – producing 88% of all aquacultured finfish. These companies are all large and vertically integrated. The integration encompasses all four phases of the

aquaculture value chain, namely: hatchery, grow-out, processing, and marketing. In contrast to the finfish sector, shellfish aquaculture in B.C. has remained highly fragmented. It involves 259 companies – including many small, family-operated businesses. A number of these companies have integrated operations and grow, process, market and distribute their own cultured shellfish.

Finfish aquaculture production takes place in many regions across the province, with primary locations in Campbell River, Port Hardy and Tofino.⁴ Most shellfish aquaculture, however, is located around Vancouver Island or within the Strait of Georgia,



Marine Harvest Canada, a subsidiary of Marine Harvest Norway, is one of the three main salmon aquaculture companies in B.C. Based in Campbell River, the company holds 50% of finfish licences in the province and employs some 500 workers. Senators toured Marine Harvest Canada's hatchery in Sayward, where they also learned about how the company collaborates with the Kitasoo/Xai'xais and Quatsino First Nations.

with Baynes Sound being the most important shellfish growing area in the province.⁵

B.C. is also home to the only land-based, closed-containment facility that produces Atlantic salmon at a commercial scale in Canada – the Kuterra Project, located near Port McNeill. There are also a few other land-based, closed-containment facilities growing different species of finfish in the province, such as Taste of BC Sea Farms, which produces

Steelhead trout. In addition, there is one small-scale, pre-commercial polyculture (also known as Integrated Multi-Trophic Aquaculture or IMTA) facility on northwest Vancouver Island; the facility holds the first commercial multi-species licence of its kind in Canada.

There is a variety of finfish and shellfish species groups currently cultured in B.C. waters (see Table 2.1), with Atlantic salmon being the

Table 2.1 – Aquacultured Species in British Columbia

Species	
Finfish	<ul style="list-style-type: none"> • Salmon (Atlantic, Chinook, Coho, Sockeye) • Rainbow/Steelhead Trout • Sturgeon • Sablefish • Tilapia • Smallmouth Bass • Arctic Char
Shellfish	<ul style="list-style-type: none"> • Oyster • Clam (Manila, Geoduck, Littleneck, Varnish) • Mussel (Pacific Blue, Gallo) • Scallop (Japanese, Giant Rock, Sea) • Abalone
Aquatic Plants	<ul style="list-style-type: none"> • Kelp • Seaweed
Other Species	<ul style="list-style-type: none"> • California Sea Cucumber • Green Sea Urchin • Grayfish

Source: According to information provided to the Committee by DFO.

5 British Columbia Shellfish Growers Association, *BC Shellfish Tenures*, n.d.

dominant species produced. Production of Chinook salmon, trout, oysters and clams are also well established in the province. Several other species including sturgeon, tilapia, sablefish, and scallops are at various stages of development. A few species of aquatic plants are also produced in limited quantity as part of the IMTA pilot project.

2.1.2 Production

As illustrated in Figure 2.1, aquaculture production in B.C. grew significantly in the 1980s and 1990s, reaching a peak at 93,020 tonnes in 2002. A combination of favourable growing conditions and an abundance of suitable sites provided the

foundation for this rapid growth. An outbreak of the Infectious Hematopoietic Necrosis (IHN) virus in salmon grow-out sites caused production to drop to 65,666 tonnes in 2004, but with improved biosecurity practices, production recovered. Aquaculture production was relatively stable between 2006 and 2010. The farm-gate value of production followed the same general trend over that period, reaching a peak at \$538 million in 2010, but declined in the two following years.

In 2013, the latest year for which data is available, B.C. produced 84,258 tonnes of aquacultured fish and shellfish, valued at \$507 million. This included

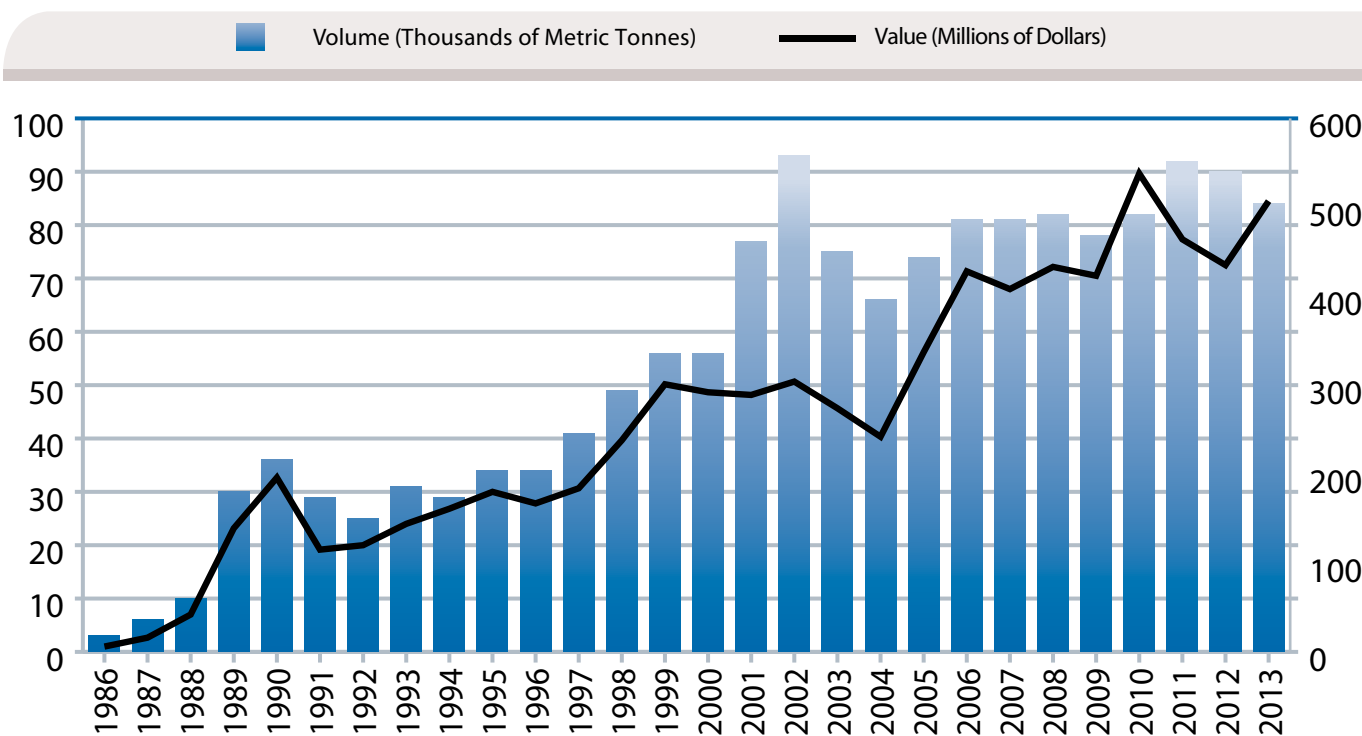


Cermaq is one of the leading salmonid aquaculture companies worldwide. A subsidiary of Mitsubishi Corporation, Cermaq has operations in Canada, Chile, and Norway. In B.C., Cermaq currently holds 22% of finfish licences where it operates 27 marine grow-out sites, four land-based hatcheries and two processing plants. Cermaq was the first salmon company in Canada to achieve “two-star” Best Aquaculture Practices (BAP) certification at its processing plant in Tofino. Senators visited one of Cermaq’s grow-out sites in Clayoquot Sound and toured its processing plant in Tofino.

75,808 tonnes of finfish, valued at \$485 million, and 8,450 tonnes of shellfish, valued at \$22 million. Figure 2.2 shows the relative importance of the species produced in the province.

B.C. is the largest producer of cultured finfish and shellfish in Canada, accounting for 49% of total volume and 53% of total value. It also ranks first in the production of salmon (75% of all volume), oysters (59%) and clams (87%) in Canada.

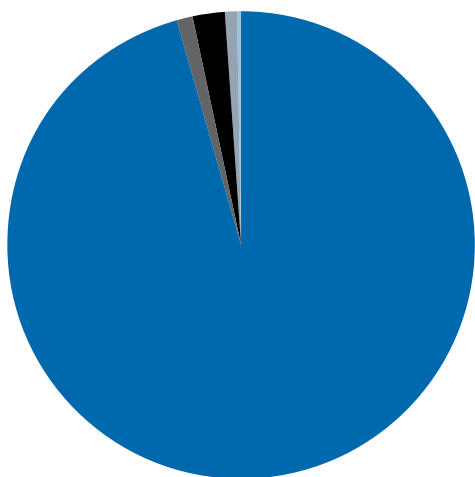
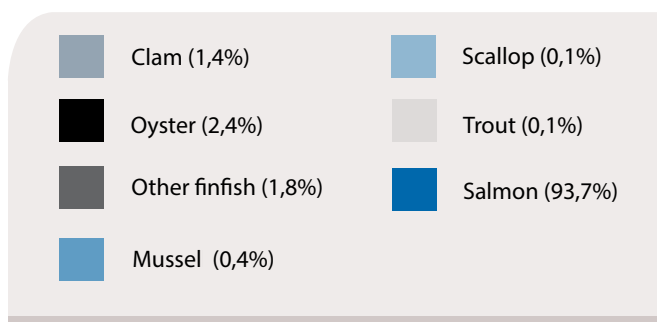
Figure 2.1 – Aquaculture Production^a in British Columbia, Volume and Value,^b 1986 to 2013



- Notes: a. Aquaculture production includes the amount and value produced on sites and excludes hatcheries or processing.
 b. At farm-gate price. The farm-gate value represents a product's value once it is sold by the producer.

Source: Based on data from DFO, *Aquaculture – Production Quantities and Values* [accessed 12 March 2015].

Figure 2.2 – British Columbia Aquaculture Production by Species, Percentage of Value, 2013



2.2 Governance

2.2.1 General Framework

The province used to be the lead authority responsible for the management of the aquaculture industry and, like most other provinces, a Canada/B.C. MOU on Aquaculture Development, signed in 1988, served to delineate the respective roles and responsibilities of the federal and provincial governments. However, a British Columbia Supreme Court decision in 2009 (the *Morton* decision) ruled that aquaculture is a fishery and, accordingly, a matter of federal jurisdiction.⁶ As a result, the federal government has assumed primary responsibility for the regulation and management of aquaculture in the province since December 2010. A revised MOU was signed between the two levels of governments, which identifies DFO as the main regulator of the aquaculture industry in B.C., while the provincial Ministry of Agriculture (BC-MA) is acknowledged as the lead agency for the strategic development of the industry in the province.⁷ The MOU also defines the roles of other federal and provincial departments, ministries and agencies. It further committed federal and provincial regulatory authorities to establish a single-window application process for all new site tenure and licence applications as well as a management committee to oversee the implementation of the agreement.

Source: Based on data from DFO, *Aquaculture – Production Quantities and Values, 2013* [accessed 12 March 2015].

The Pacific Aquaculture Regulations define aquaculture as “the cultivation of fish”.

6 *Morton v. British Columbia*, 2009 BCSC 136.

7 *Canada – British Columbia Agreement on Aquaculture Management*, 10 December 2010.

In response to the *Morton* decision, DFO developed the *Pacific Aquaculture Regulations*, under the *Fisheries Act*, to replace the previous provincial regime and solidify the new federal/provincial arrangement.⁸ These regulations set conditions that state the obligations of aquaculture licence holders for each sector – marine finfish, marine shellfish, and freshwater/land-based operations; they also prescribe standards and protocols for the operation of all aquaculture facilities in the province. In response to the MOU, DFO also established an Aquaculture Management Advisory Committee (AMAC) for finfish aquaculture and

an AMAC for shellfish aquaculture. These advisory committees review management plans on a regular basis and provide advice and recommendations to DFO with respect to the management of finfish and shellfish aquaculture in B.C. In its aquaculture policy framework within the Pacific Region, DFO states that it “is committed to being both an enabler and a regulator of aquaculture development, affirming its role as a department engaged in sustainable resource development.”⁹ In this context, “enabling” means “improving the business climate for aquaculture development to benefit Canadians.”¹⁰



Creative Salmon is a Canadian-based aquaculture company that raises Chinook salmon. Founded in 1990, the company currently holds 5% of finfish licences in B.C. and operates in the waters of Clayoquot Sound near Tofino, on the West Coast of Vancouver Island. Creative Salmon is fully integrated and employs about 50 people. In December 2013, the company was awarded the Canadian Organic Aquaculture Standard. Senators toured Creative Salmon’s grow-out site in Tofino.

8 *Pacific Aquaculture Regulations*, Fisheries Act, SOR/2010-270.

2.2.2 Licence Application Process

A Crown land tenure, a navigable waters approval and an aquaculture licence are required to operate marine finfish and shellfish aquaculture grow-out sites in B.C. The provincial Ministry of Forests, Lands and Natural Resource Operations (BC-FLNRO) is responsible for issuing Crown land tenures under the *Land Act*, which authorizes the use of space where an aquaculture facility will operate. The standard form of Crown land tenure for a finfish aquaculture operation is a licence of occupation, which is usually issued for a five-year term, but may be for up to 20 years at the discretion of the BC-FLNRO. The standard Crown land tenure for a shellfish aquaculture operation is a lease, which may be issued for up to 30 years. The BC-FLNRO may also grant an investigative permit for the purpose of aquaculture, which has a maximum term of two years. This permit allows for the investigation of an aquaculture project's feasibility or the placement of monitoring equipment. The BC-FLNRO will not accept competing aquaculture applications over the site during the term of the permit. An investigative permit does not guarantee any future tenure.¹¹

An approval from Transport Canada is also required, under the *Navigation Protection Act*, for the placement of aquaculture containment and/or structures within the navigable waters of Canada; this approval is issued for a five-year term.

DFO issues the aquaculture licence, which allows the proponent to carry out the activity of aquaculture.

The term of the aquaculture licence is currently limited to one year; recently, DFO has proposed amending the *Pacific Aquaculture Regulations* to implement multi-year aquaculture licences in B.C. However, consistent with the Cohen Commission recommendations, licences in the Discovery Islands will remain limited to one year pending the completion of scientific assessments and regulatory work in the area.

A licence application must also be submitted and approved for an amendment to an existing federal aquaculture licence (e.g., change in production level, change in species, change in net cages, ownership change), for an amendment to the Crown land tenure (e.g., size or relocation of tenure boundaries), and for any rebuild, repair or alteration of an existing infrastructure that may have an impact on public navigation.

In their review of applications for new marine finfish sites, DFO and BC-FLNRO consider a wide range of factors, including: proximity to significant anadromous salmonid streams and major herring spawning areas (within 1 kilometre); proximity to intertidal shellfish beds (within 300 metres); proximity to existing finfish aquaculture sites (within 3 kilometres); proximity to a First Nation reserve (within 1 kilometre); sensitive fish habitat; areas used extensively by marine mammals; potential for infringement of riparian rights of an upland owner; and more.¹² The review of applications for new shellfish sites also includes water quality considerations.

9 For more information, see DFO, *Pacific Region: Integrated Management of Aquaculture Plan – Marine Finfish*, December 2013, p. 16, and *Pacific Region: Integrated Management of Aquaculture Plan – Shellfish*, July 2014, p. 17.

10 *Ibid.*

11 BC-FLNRO, *Land Use Operational Policy – Aquaculture*, June 2011.

12 Government of Canada and Government of British Columbia, *Guide to the Pacific Marine Finfish Aquaculture Application*, 31 July 2014.

The licence application process includes consultations by federal and provincial regulatory authorities with First Nations in order to meet the Crown's duty to consult. In addition, aquaculture companies are encouraged to contact potentially affected First Nations early in the planning process to share information and seek their views with respect to the planned aquaculture operation/site.¹³

To simplify the aquaculture approval process, a single, harmonized application forms have been

developed by DFO, BC-FLNRO and Transport Canada, one for the finfish sector and one for the shellfish sector.¹⁴ FrontCounter BC is the office responsible for receiving and processing all aquaculture applications in the province.¹⁵

As per the recommendation of the Cohen Commission, there is currently a moratorium on new marine finfish aquaculture licences and on substantial amendments to existing marine finfish licences in the Discovery Islands area until the end



Fanny Bay Oysters is a Canadian company that grows Pacific oysters and Manila clams in Baynes Sound, on the East Coast of Vancouver Island. Senators were given a tour of the company's depuration facility located in Fanny Bay, which holds the shellfish in a clean seawater environment for a time, to allow them to free themselves of microorganisms. Fanny Bay Oysters exports its products to Europe, Asia, and the United States.

13 Ibid.

14 For more information, see the [Pacific Marine Finfish Application Form](#) and the [Pacific Shellfish Application Form](#).

15 See the website at [FrontCounter BC](#).

of September 2020.¹⁶ In the meantime, scientific research is being conducted, using a new disease risk assessment framework, to evaluate some of the environmental impacts linked to aquaculture, including wild-cultured interactions related to fish health.

2.2.3 Monitoring, Compliance and Enforcement

Together with the regulations, the conditions stipulated in the DFO aquaculture licence are the primary management tools for aquaculture facilities in B.C. The conditions of licence for marine finfish aquaculture set out the specific operational and reporting requirements to which aquaculture facilities must adhere to legally operate and be in compliance with the *Fisheries Act* and its regulations. These include both generic and site-specific licence conditions, such as: species and biomass that can be cultivated, thresholds regarding impacts on the surrounding environment, introductions and transfers, escape prevention, sea lice monitoring, fish health management plans, and more. The licence conditions also require licence holders to submit a number of reports on a regular basis which relate to the ongoing operation of their facilities.

The day-to-day management of the fisheries and environmental aspects related to marine finfish and shellfish aquaculture in the province – including environmental monitoring, containment plans, fish health management, habitat protection, introductions and transfers, and more – is carried out under the British Columbia Aquaculture Regulatory Program (BCARP). As part of this program, DFO staff conduct regular monitoring and inspection activities to determine compliance with aquaculture licences, conditions of licence and other applicable legislation. They also audit industry-generated environmental information and reports to ensure their accuracy (e.g., sea lice count and benthic monitoring). In addition, they respond to complaints and undertake investigations.

The information collected by industry and that obtained by DFO from ongoing monitoring and inspection activities is compiled and released publicly by DFO on a quarterly basis through its public reporting website. The website currently provides data on: escape events, benthic monitoring, sea lice, incidental catches, marine mammal interaction, introductions and transfers, and use of lights. DFO also reports on its compliance assessment activities (number of site visits, number of sea lice audits, number of benthic site assessments) and on its fish health management activities (number of facilities audited and number of carcasses sampled), but does not report the results of these activities.¹⁷

16 Cohen Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River, *Final Report*, October 2012.
17 DFO, *Public Reporting on Aquaculture*.



Senators toured Taste of BC Aquafarms Inc., a small family business operating a land-based closed-containment facility in Nanaimo, which utilizes 15 different tanks. The company raises Steelhead salmon using recirculating aquaculture systems.

CHAPTER 3: New Brunswick

3.1 Profile of the Industry

3.1.1 Structure and Location

The aquaculture industry in N.B. comprises three sectors: finfish, shellfish and aquatic plants. The vast majority (96%) of aquaculture production in the province consists of finfish production; shellfish production accounts for the remaining 4%. The aquaculture of marine plants is still at the developmental stage. The variety of species aquacultured in N.B. is presented in Table 3.1.

Similar to other provinces and countries, the structure of the finfish sector in N.B. has changed significantly over the years as a result of consolidation and integration. In 2012, there were 92 marine finfish grow-out sites in southwestern N.B., all located in the Bay of Fundy. Forty-five of these sites were actively growing salmon, one was used for research, and the remaining 46 were fallow. The 45 active sites were controlled by five locally-owned companies, with one company operating 60% of the sites. Today, only three aquaculture companies

operate in the region: Cooke Aquaculture, Northern Harvest Sea Farms, and Benson Aquaculture. Some IMTA projects take place in the Bay of Fundy, with five finfish sites licensed for additional species such as kelp and mussels. With respect to other finfish-rearing technologies, there is one producer growing sturgeon in land-based tanks, located in Charlo, Pennfield, and St. Andrews.

For its part, the shellfish aquaculture sector consists of a large number of growers located along the East Coast of the province, particularly in three major bays: Bouctouche Bay, Caraquet Bay, and Cocagne Bay. Due to weather conditions, shellfish growers in certain areas are forced to move their stocks and structures in the winter to prevent damage and losses. For this reason, they have access to overwintering sites (typically from 1 September to 1 May). In 2012, there were approximately 85 shellfish growers operating 703 grow-out sites, mostly growing oysters. Of these sites, 502 were active (including 15 overwintering sites) and 201 were vacant.

Table 3.1 – Aquacultured Species in New Brunswick

	Species
Finfish	<ul style="list-style-type: none">• Atlantic Salmon• Atlantic Sturgeon• Steelhead/Rainbow Trout
Shellfish	<ul style="list-style-type: none">• American Oyster• Blue Mussel
Aquatic plants	<ul style="list-style-type: none">• Seaweed• Kelp

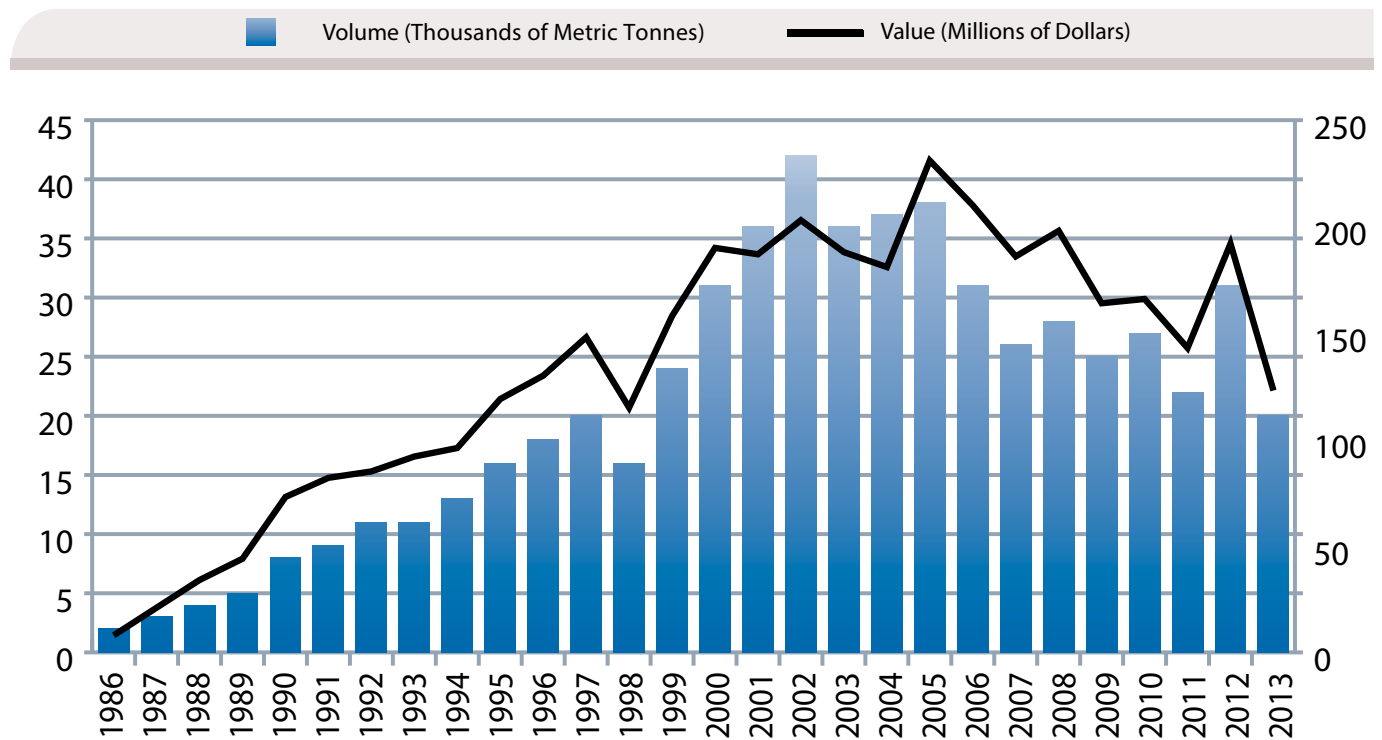
Source: According to information provided to the Committee by DFO.

3.1.2 Production

As can be seen in Figure 3.1, aquaculture production in N.B. grew continually between 1986 and 1997. Government support for the industry and the opening of commercial hatcheries contributed to this growth. A moratorium on new licence applications was placed between 1986 and 1991 and, although it slowed the growth, it did not stop it. In addition, production was affected in 1998

due to an outbreak of Infectious Salmon Anaemia (ISA) in the Bay of Fundy. The outbreak forced several grow-out sites to be completely harvested and fallowed. This was followed by a strong recovery and production reached a peak in 2002. Production declined again between 2006 and 2011, more specifically due to the introduction of a new bay area management system to better manage further ISA outbreaks. The new approach effectively

Figure 3.1 – Aquaculture Production^a in New Brunswick, Volume and Value,^b 1986 to 2013



- Notes: a. Aquaculture production includes the amount and value produced on sites and excludes hatcheries or processing.
 b. At farm-gate price. The farm-gate value represents a product's value once it is sold by the producer.

Source: Based on data from DFO, *Aquaculture – Production Quantities and Values* [accessed 12 March 2015].

reduced the number of sites in production by shifting from a two-year to a three-year rotation system, with a mandatory fallowing period between consecutive year classes. Production volume reached 31,481 metric tonnes in 2012, valued at \$192 million. This was followed by a reduction of more than 33% in both production volume and value in 2013.

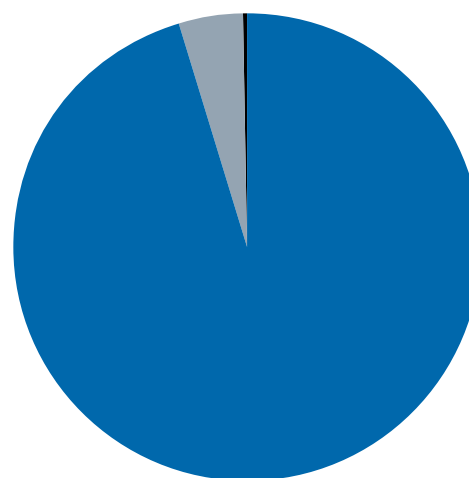
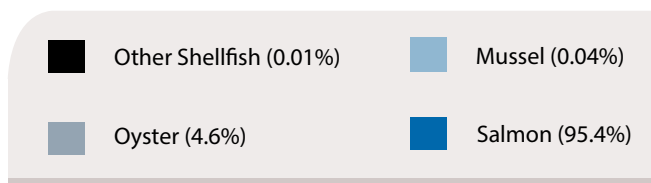
As illustrated in Figure 3.2, aquaculture production in N.B. is dominated by Atlantic salmon. The province was the second largest producer of Atlantic salmon in Canada, behind B.C., until 2013 when it was surpassed by N.L. American oyster dominates shellfish production and N.B. is the third largest producer of oysters in Canada, behind B.C. and P.E.I.

3.2 Governance

The New Brunswick Department of Agriculture, Aquaculture and Fisheries (NB-DAAF) and DFO serve as the lead provincial and federal departments in aquaculture regulation. The responsibilities of the two departments are articulated in the *1989 Canada–New Brunswick Memorandum of Understanding on Aquaculture Development*. This MOU gave the province responsibility for the licensing and leasing of aquaculture operations, while both levels of government cooperate in the development of site allocation criteria. Other departments and agencies are also involved in the support, development and regulation of the aquaculture industry. In particular, the New Brunswick Department of Environment and Local Government (NB-DELG) plays an important role in the environmental management of the industry (see section 3.2.3).

Through another MOU signed in 2008, the government of N.B. works collaboratively with the governments of N.L., N.S., and P.E.I. for the development of a sustainable aquaculture industry in the

Figure 3.2 – Aquaculture Production in New Brunswick by Species, Percentage of Value, 2013



Source: Based on data from DFO, *Aquaculture – Production Quantities and Values, 2013* [accessed 12 March 2015].

Atlantic Provinces. With respect to governance, the MOU commits the four provincial governments to work towards a harmonized regulatory and policy environment, to the extent possible, in areas such as leasing and licensing, environmental monitoring, introductions and transfers, aquaculture

statistics, and aquatic animal health. The MOU also provides for a unified voice when dealing with the federal government by working towards a harmonized regulatory and policy environment.¹⁸

3.2.1 General Framework

When the salmon aquaculture sector began in N.B. in the late 1970s and early 1980s, there were no policies or legislation specific to aquaculture. In 1985, following a directive by a joint government-industry committee, the provincial government established guidelines on the physical separation between grow-out sites and fixed commercial fishing gear, such as herring weirs and lobster pounds, or other marine structures, such as wharfs. The distance separating these structures corresponded to a minimum of 300 meters. A moratorium on new aquaculture applications was then imposed between 1986 and 1991, in order to develop a site allocation policy specific to finfish aquaculture.

In 1988, the provincial *Aquaculture Act*¹⁹ was passed and, in 1991, the General Regulation²⁰ under the Act was adopted.²¹ The legislation and associated regulation, which were amended over the years, govern the aquaculture of finfish, shellfish and aquatic plants. The site allocation policy for finfish aquaculture was introduced in 1991. This policy aimed to promote industry growth, with an emphasis on getting new entrants into the industry while insisting on the need to integrate aquaculture with both the commercial fishery sector and other marine resource users. As

The *Aquaculture Act* defines aquaculture as “the cultivation of aquatic plants and animals, but does not include the cultivation of aquatic plants and animals in a laboratory for experimental purposes or in an aquarium”.

part of the policy, guidelines on the size of finfish grow-out sites were established in 1993, including a formula for determining the maximum allowable biomass. These guidelines were used until 2005, when a performance-based standard framework focussing on environmental performance was introduced to regulate the industry (see section 3.2.3). In the mid-1990s some fish health problems emerged, which triggered the implementation of industry-wide bay-scale management practices in 2000 (see sections 3.2.4 and 3.2.5).

Since 2010, aquaculture governance in N.B. has also been guided by two key policy documents: the *New Brunswick Finfish Aquaculture Development Strategy*²² and the *New Brunswick Shellfish Aquaculture Development Strategy*²³. These two five-year strategies (2010–2014) focus on the following seven areas: governance; competitiveness and business financing; business risk management; finfish/shellfish health and biosecurity; market access and consumer confidence; strategic infrastructure; and, species diversification. The strategies, which promote the development of the finfish and shellfish sectors and their environmental sustainability, are currently under review.

18 *Atlantic Provinces’ Memorandum of Understanding for the Development of the Aquaculture Sector*, 18 January 2008.

19 *Aquaculture Act*, R.S.N.B. 2011, Chapter 112.

20 New Brunswick **Regulation 91-158** under the *Aquaculture Act*.

21 The *Aquaculture Act* is not enabling legislation in the sense that it does not include a purpose section that promotes the development of the industry. Rather, the development of this industry and its environmental sustainability are promoted in public policy documents which also recognize aquaculture as a legitimate user of the marine environment.

22 Government of New Brunswick, *New Brunswick Finfish Aquaculture Development Strategy*, July 2010.

23 Government of New Brunswick, *New Brunswick Shellfish Aquaculture Development Strategy*, July 2010.

3.2.2 Lease, Permit and Licence

A lease, an occupation permit, and a licence are all required to operate an aquaculture facility in N.B. The lease authorizes the company to operate on Crown lands (or waters); it is issued for a period of 10 to 20 years. The occupation permit is similar to the lease in that it allows occupation and use of a specified area for a temporary period of up to three years; in most cases it is delivered prior to the issuance of a lease. The aquaculture licence confers the authority to conduct aquaculture at a specific site; it also prescribes the various activities that can take place on the site. The aquaculture licence is valid for a period of up to 20 years.

New site allocations, changes to existing sites, sub-leasing of sites, and transfers of sites are further subject to one of the two following policies: the *Bay of Fundy Marine Aquaculture Site Allocation Policy*²⁴ applies to the aquaculture of Atlantic salmon, alternate finfish, shellfish, and aquatic plants in the Bay of Fundy, while the *Marine Aquaculture Site Allocation Policy for the East Coast of New Brunswick*²⁵ applies to shellfish aquaculture on the East Coast of the province.

Applicants wishing to obtain an aquaculture lease, occupation permit, or licence must submit an application to NB-DAAF and pay a fee that varies depending on the nature of the application, as set out in the *Aquaculture Act* and regulations. Further approval may be required from Transport Canada for aquaculture projects where structures are to be built or placed in, on, over, under, through, or across any navigable waters. The federal government may also have to assess the impact of proposed aquaculture sites with respect to a number of other matters, including Aboriginal rights and migratory birds. NB-DAAF appraises all

applications and coordinates the review with other provincial and federal departments and agencies. Each agency evaluates applications from the standpoint of its specific jurisdiction and forwards its comments and recommendations to NB-DAAF. The decision to issue or refuse a lease, occupation permit or licence ultimately lies with NB-DAAF. The General Regulation identifies four circumstances where an aquaculture licence may be refused, including conflict with other fishery activities or the creation of unacceptable environmental risks.

Every application for a new aquaculture site must be brought to the attention of the owners of adjacent properties in the vicinity of the proposed site by means of a written notice. In addition, applications for amendments to the culture methods indicated in a licence may be subject to consultation with adjacent property owners. Similarly, every application for a vacant and a new aquaculture site must be brought to the attention of the public through announcements published in newspapers, at the applicant's expense.

The aquaculture licence indicates the species authorized for cultivation. Licences also include conditions related to: site utilization, stocking densities and production volumes; year-classes; length of the fallow period; measures to be taken to minimize the risk of environmental degradation; measures to be taken to prevent escapes; measures to be taken to minimize the risk of disease, disease agents, parasites, toxins, or contaminants spreading to other aquaculture sites; and more.

The holder of an aquaculture licence must submit a report each year on its operations using a template form provided by NB-DAAF. The licensee must prepare and keep books, records, accounts,

24 Government of New Brunswick, *Bay of Fundy Marine Aquaculture Site Allocation Policy*, 2000.

25 Government of New Brunswick, *Marine Aquaculture Site Allocation Policy for the East Coast of New Brunswick*, n.d.

and other documents required by or in accordance with the *Aquaculture Act* or its regulations. The licensee must be prepared to provide books, records, accounts, and other documents in such detail and form as required by the *Aquaculture Act* or its regulations in order to check the on-site activities and the accuracy of the annual report.

3.2.3 Environmental Monitoring of Marine Finfish Aquaculture

In addition to the aquaculture lease and licence, a company wishing to operate a marine finfish grow-out site in N.B. must obtain a certificate of approval, which is issued by NB-DELG. As part of this process, which rests on performance-based

standards, the company must submit a production plan which is reviewed by the Aquaculture Site Environmental Review Committee (ASERC). This committee is chaired by NB-DELG and is made up of representatives from NB-DAAF and DFO. The ASERC undertakes a historic review of site production and environmental data and provides advice to NB-DELG, which is responsible for the issuance of the certificate of approval. The certificate includes conditions with respect to environmental monitoring requirements, waste management plans, chemical storage and handling, and noise control if the production plan has been approved.

As per the conditions of their certificate of approval, companies are required to conduct



Kelly Cove, a subsidiary of Cooke Aquaculture, is collaborating with the University of N.B. and DFO in an IMTA project growing seaweeds (winged and sugar kelp) along with shellfish (Blue mussels) and finfish (Atlantic salmon). Senators were given a tour of the IMTA located in Back Bay, N.B.

Photo courtesy of: Dr. Thierry Chopin.

environmental monitoring of their aquaculture sites in compliance with the *Standard Operating Practices for the Environmental Monitoring of the Marine Finfish Cage Aquaculture Industry in New Brunswick* (SOP).²⁶ This self-monitoring is undertaken at three different times during the year. For each monitoring activity conducted, the SOP provides guidance for determining the number and position of transects and sediment samples, video recordings, site plans, collecting and analyzing sediment samples, waste disposal and record keeping. The objective of the monitoring is to measure the sediment sulphide concentration which is related to the health of the benthic environment in the immediate area adjacent to the cage structures and lease area. In addition to this self-monitoring, marine finfish cage aquaculture sites are also monitored by NB-DELG under its Environmental Management Program (EMP)²⁷. A minimum of 20% of all marine finfish cage aquaculture sites are subject to the program every year and their sediment sulphide concentration is evaluated once again to verify compliance. The results of the site monitoring are released annually on NB-DELG's website.²⁸

Marine finfish grow-out sites are then rated in relation to their sediment sulfide concentrations and classified as oxic, hypoxic or anoxic (measured in micromoles/litre or μM). Oxic means that the sediment sulfide concentration is less than 1,500 μM and that the site is performing well and requires minimal remedial action. Hypoxic refers to a concentration between 1,500 μM and 6,000 μM and requires facilities to undertake a number of remedial measures as they are likely to cause adverse environmental effects. Anoxic denotes a

concentration that is greater than 6,000 μM and refers to sites that are causing severe damage to the marine habitat and will be directed to work closely with regulatory agencies to remedy the situation. Remediation plans include actions to reduce organic enrichment impacts, such as improving feeding methods, cleaning nets or equipment offsite, reducing stocking densities, repositioning of cages in relation to onsite water currents, staff training, and internal and external audits to ensure that best management practices are being followed. According to NB-DELG, the EMP promotes better environmental performance, since companies must receive good environmental ratings if they wish to maintain or increase production levels.

3.2.4 Sea Lice

The salmon aquaculture sector experienced a first major outbreak of sea lice in southwest N.B. in 1994. The following year, the province established 10 sea lice management zones in the region and chemical treatment using SLICE[®] (or emamectin benzoate, an in-feed drug) was coordinated within each zone. The use of SLICE[®], along with best management practices, was successful in controlling sea lice in the region for about a decade. That said, between 2006 and 2008, it was noted that the regular use of this single product had caused sea lice populations to become resistant. As a result, other chemical treatments were used or tested.

For example, NB-DAAF collaborated with industry to research and monitor the use of well-boats for the delivery of three different bath treatments (Paramove[®] – a hydrogen peroxide product,

26 NB-DELG, *Standard Operating Practices for the Environmental Monitoring of the Marine Finfish Cage Aquaculture Industry in New Brunswick*, July 2012. .

27 NB-DELG, *The Environmental Management Program for the Marine Finfish Cage Aquaculture Industry in New Brunswick*, August 2012.

28 NB-DELG, *Marine Aquaculture – Environmental Monitoring Results*, various years.

Salmosan® and AlphaMax®).²⁹ The research showed that a lower concentration of chemotherapeutant was required for each product when used in a well-boat versus a tarped or skirted net cage.³⁰ It also showed that treatment in the well-boat was less costly. This project prompted NB-DAAF and DFO to develop, in 2011, an Integrated Pest Management Program (IPMP) for Sea Lice in collaboration with industry, fish health experts and other stakeholders. The IPMP encompasses three main components: prevention and control measures, monitoring, and data collection and analysis:

- Prevention and control measures include non-chemotherapeutant control strategies (Bay Management Areas or BMAs, year-class separation, fallowing, and the use of cleaner-fish, sea lice traps and well-boats); chemotherapeutant control strategies (in-feed and bath treatment); and treatment strategies (treatment thresholds; product rotation; site-based and area-based treatment; and, seasonal treatment).
- Monitoring includes: standardized sampling and counting protocols, counting frequency, reporting of sea lice counts, auditing, and treatment efficacy monitoring.
- Data collection and analysis with respect to: sea lice dynamics and trends, treatment efficacy, early signs of treatment resistance or tolerance, and regional differences.³¹

In 2013, the provincial government developed amendments to the General Regulations under the *Aquaculture Act* with respect to the reporting on sea lice. Aquaculture licence holders are now

required to submit, at the beginning of each year, a sea lice management and treatment plan that includes, for each grow-out site, the following information: the names of all the products expected to be used for sea lice treatment at the site, the method of administering the treatment, and the estimated timing of treatment at the site. Each week, licence holders are required to inform NB-DAAF whether or not a sea lice treatment is planned at any of their aquaculture sites. If a treatment is planned, the licence holder must perform a sea lice count at each affected site and report this information to the department. Furthermore, the department has established trigger levels for lice infestations that dictate when treatments should occur.³²

3.2.5 Infectious Salmon Anaemia

The next major fish health problem encountered by the salmon aquaculture sector in N.B. was ISA in 1996. At the time, there were no drug treatments for ISA, and vaccines only had limited effectiveness. It was acknowledged that the high density of grow-out sites in some areas of the Bay of Fundy was a major factor contributing to the spread of ISA. Accordingly, some grow-out sites were removed from the region in 1997 and 1998.

In 2000, as part of the *Bay of Fundy Marine Aquaculture Site Allocation Policy*, 22 BMAs were established in the region; their boundaries were based on a combination of oceanographic, fish health, and business considerations. Within each BMA, grow-out sites were required to hold fish of the same year-class (only one generation of fish on a site at any time) and to operate on a two-year crop

29 It should be noted that the PMRA approved the emergency registration of AlphaMax® but revoked it later on. This product is no longer an approved pest control product in Canada for sea lice control.

30 Atlantic Canada Fish Farmers Association, *Evaluation of Well-Boat Technology for the Treatment of Sea Lice*, DFO, 2010.

31 Kathy Brewer-Dalton, *Integrated Pest Management Program (IPMP) for Sea Lice*, NB-DAAF, 25 February 2013.

32 Government of New Brunswick, *The Royal Gazette*, Volume 171, 20 February 2013, pp. 384–387.

rotation system, with smolt entries in either odd or even years. In addition to the BMAs, the new policy included Controlled Growth Areas and Exclusion Areas. The Controlled Growth Areas were identified where grow-out site densities were already high, while exclusion areas were designated regions with commercial fisheries. In these two categories of areas, new aquaculture applications were not accepted, although expansions at existing grow-out sites could be considered. These area types remain in effect to the present day.³³

Despite the implementation of the policy in 2000 and BMA framework, ISA continued to be a challenge in southwestern N.B. In fact, the policy possessed two major caveats: it allowed for holdovers of fish on grow-out sites (i.e., up to 20% of market fish could remain on a site when the new class of smolt were introduced) and it did not make fallowing mandatory between year-classes. These two caveats appeared to be major factors contributing to the persistence of ISA in the region. Accordingly, the BMA framework was revised in 2006 and the



Breviro Caviar is a N.B. aquaculture company that grows shortnose sturgeon for both meat and caviar. The company operates three land-based closed-containment facilities located in St. Andrews, Charlo, and Pennfield. Breviro Caviar is the only company in the world to hold the licence under the Convention on International Trade in Endangered Species (CITES) to grow and sell caviar from the shortnose sturgeon. The company also collaborates with the Eel River Bar and Listuguj First Nations. Senators had the opportunity to tour the Pennfield facility.

region was divided into three large BMAs operating on a three-year crop rotation system for the smolt entries: BMA1 (2006, 2009 and 2012); BMA2 (2007, 2010 and 2013) and BMA3 (2008, 2011 and 2014), the latter containing a sub-area designated as a wharf zone for the industry. The three large BMAs covered 95% of the estimated production capacity. Three smaller BMAs were also identified: BMA4 and BMA5 had no specified smolt entry times and BMA6 was designated as an alternative species zone (oceanographic studies suggested that the BMA6 area was conducive to the transmission of disease between grow-out sites and, accordingly, it was decided that only non-salmonid species could be grown in the area). The revised policy also required mandatory synchronized fallowing of sites within BMAs before restocking. It is believed that the new BMA framework, together with further improvements to biosecurity and other aquaculture management practices, have contributed to improved fish health in the Bay of Fundy as there have been no confirmed cases of ISA in the region between the fall of 2006 and the spring of 2015.

In 2009, NB-DAAF adopted the *New Brunswick Marine Aquaculture Finfish Health Policy*. The policy gives the province authority over the management of diseases of concern to fish from aquaculture. This policy, which is complementary to the Federal Fish Health Protection Regulations and the National Aquatic Animal Health Program, requires that all diseases be reported to NB-DAAF within seven days of diagnosis. In addition, the policy prescribes operational standards that apply to aquaculture operators, harvest vessels, and

processing plants to ensure that all reasonable steps are taken to minimize the risk of introducing disease and/or disease agents into aquaculture facilities. NB-DAAF undertakes surveillance and monitoring activities to ensure that the industry complies with the policy.³⁴

3.2.6 Containment and Recapture

In 2009, DFO and NB-DAAF finalized the *Southwest New Brunswick Breach of Containment Governance Document*, which details the provincial and federal requirements concerning breaches of containment and re-capture of escapees in the Bay of Fundy. The document, which at the time this volume was written was being revised, complements the *Code of Containment for Culture of Atlantic Salmon in Marine Net Pens in New Brunswick*, developed by the New Brunswick Salmon Growers Association in 2008.³⁵ The code describes the types of equipment and infrastructure that can meet the rigours of the marine environment in which they are to be deployed, prescribes how equipment must be inspected and maintained according to specific schedules, enunciates reporting requirements, and establishes contingencies to be followed in the event of escapes. The governance document and the code provide management techniques that incorporate measures to ensure that the risk of escapes is minimized. The General Regulation was also revised in 2010 to include requirements for mandatory reporting of all escapes of 100 salmon or more from an aquaculture site and a breach of containment management plan which includes inspection and mitigation.

34 Government of New Brunswick, *New Brunswick Marine Aquaculture Finfish Health Policy*, 2009.

35 New Brunswick Salmon Growers' Association, *Code of Containment for Culture of Atlantic Salmon in Marine Net Pens in New Brunswick*, 2008.

3.2.7 Bay Management Areas for Oyster Aquaculture

BMAs for oyster aquaculture were also developed by NB-DAAF and DFO in 2003 with the objective of streamlining the site review process for oyster aquaculture. This BMA framework currently consists of four components:

- Bay management plans: These plans were finalized in 2007 and identified four zones conducive to oyster aquaculture: class A (all culture methods – bottom, near bottom and water column); class B (bottom and near bottom culture); class C (bottom culture methods only); and class D (no water column; temporary overwintering site).
- Environmental assessment (EA) class screening report: Rather than completing an EA for each oyster culture project, projects are streamlined through a class screening report, which is built on and uses the knowledge accumulated

through past EAs. The class screening report identifies measures that are known to reduce or eliminate the likelihood of adverse environmental effects for a type or class of project.

- Adaptive management process: Data from field surveys and research conducted by federal and provincial agencies are reviewed annually to track the evolving scientific and technical knowledge related to the activities of this sector. Changes in oyster aquaculture management practices are recommended when necessary.
- Code of practice: The New Brunswick Professional Shellfish Growers Association developed a Code of Practice in 2005. Although the code is a voluntary instrument, it complements the various regulatory mechanisms in place and it defines practical steps to achieve greater environment stewardship within the shellfish aquaculture sector.



Senators learned about oyster culture at the Little Shemogue Oyster Company, which leases 25 acres in Little Shemogue Bay, N.B., where it grows American oysters. The company uses bottom-culture to grow oysters in a variety of sizes and shapes and suspension methods that yield “cocktail” oysters.

CHAPTER 4: Newfoundland and Labrador

4.1 Profile of the Industry

4.1.1 Structure and Location

The aquaculture industry in N.L. is very different from that of B.C. and the other Atlantic Provinces. The biogeography, climate, oceanography, and marine resources in the province are such that the industry faces different biological and physical challenges (i.e. low water currents, low water temperatures, naturally low dissolved oxygen levels, and hard bottom substrates) compared to other regions of the country. Over the years, commercial aquaculture was attempted for a variety of species in the province with limited success. Currently, there are only three species of finfish and one species of shellfish produced commercially in N.L. waters (see Table 4.1). There are no land-based, closed-containment facilities growing finfish for commercial purposes in the province, nor are there any active IMTA sites.

The majority of finfish aquaculture takes place in the Connaigre Peninsula along the southeast coast

of the island. Shellfish aquaculture occurs along all coasts, but is concentrated in the Notre Dame Bay area on the north-east coast.³⁶ There are no aquaculture sites in Labrador. In total, there were 87 commercial finfish site licences in 2013, covering a combined area of 2,376 hectares.³⁷ There were also 53 commercial shellfish site licences that covered a combined area of 4,162 hectares.³⁸

The structure of the finfish sector within the province has changed significantly over the years as a result of consolidation and integration. There are now three large companies involved in the sector: Cooke Aquaculture (Cold Ocean Salmon), Gray Aquaculture (Gray Aqua Group), and Northern Harvest Sea Farms. These three companies are vertically integrated and operate salmonid hatcheries, grow-out sites and processing plants in various locations. Northern Harvest Sea Farms is also a manufacturer of finfish nets and cages. There are also a number of smaller companies, including Nova Fish Farms (which grows Steelhead trout) and Nordic Salmon Company (which grows Arctic char).

Table 4.1 – Aquacultured Species in Newfoundland and Labrador

	Species
Finfish	<ul style="list-style-type: none">• Atlantic Salmon• Steelhead Trout• Arctic Char
Shellfish	<ul style="list-style-type: none">• Blue Mussel

Source: According to information provided to the Committee by DFO.

36 For a location of these sites, see the following [map](#).

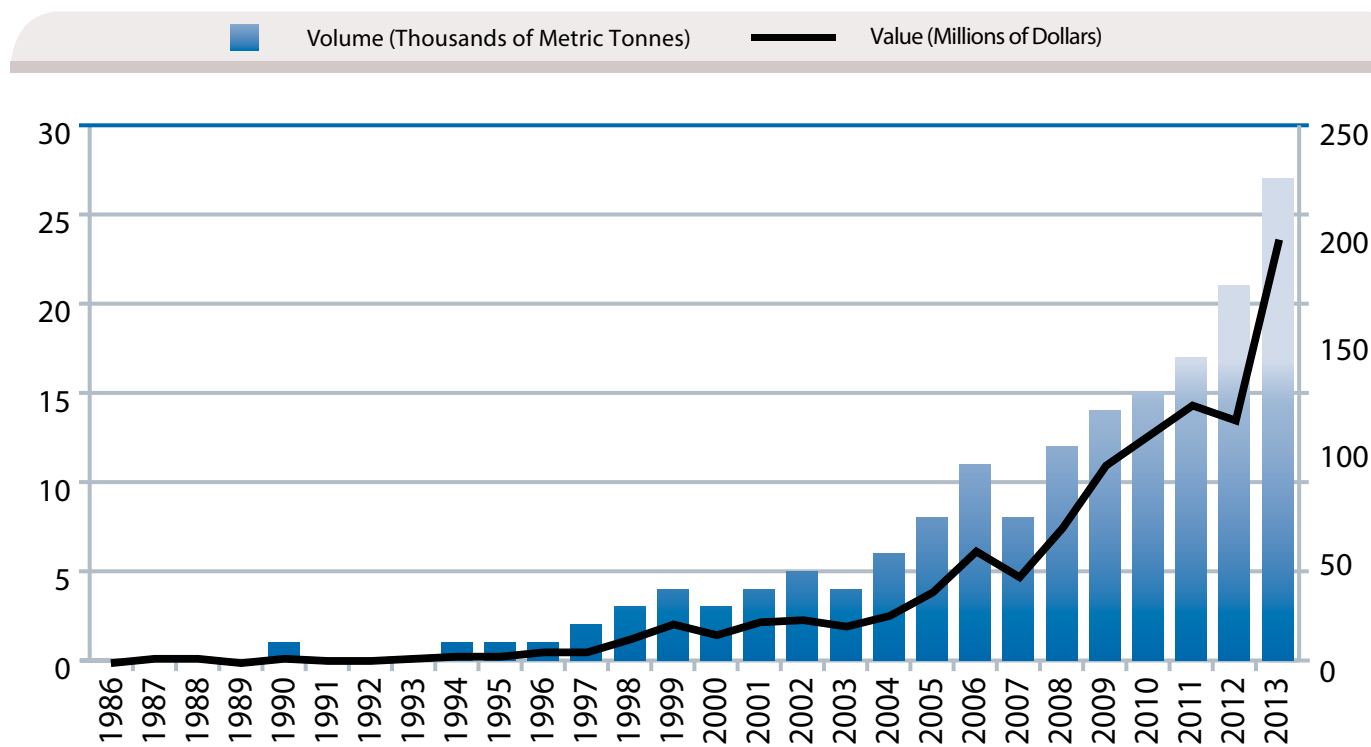
37 Newfoundland and Labrador Department of Fisheries and Aquaculture, *Seafood Industry Year in Review – 2013*, February 2014, p. 11.

38 *Ibid.*

The three large finfish aquaculture companies also operate facilities outside of N.L. Cooke Aquaculture has salmon operations in N.B., N.S., P.E.I., the United States (Maine), Chile and Scotland, as well as sea bass and sea bream operations in Spain. Both Northern Harvest Sea Farms and Gray Aquaculture have salmon aquaculture operations in N.B., where their head offices are located.

Over the last few years, the shellfish sector in N.L. has also witnessed some consolidation. A few companies have integrated operations that grow, process, market, and distribute their own cultured shellfish. The rest of the sector involves small family-operated businesses. Mussel growers have pooled inventory to ensure processors and marketers have sufficient product to meet the

Figure 4.1 – Aquaculture Production^a in Newfoundland and Labrador, Volume and Value,^b 1986 to 2013



- Notes: a. Aquaculture production includes the amount and value produced on sites and excludes hatcheries or processing.
- b. At farm-gate price. The farm-gate value represents a product's value once it is sold by the producer.

Source: Based on data from DFO, *Aquaculture – Production Quantities and Values* [accessed 12 March 2015].

demands of their clients throughout the year. In March 2013, eight mussel growers and three primary processors in N.L. were certified to the Canadian Organic Aquaculture Standard.³⁹

4.1.2 Production

As can be seen from Figure 4.1, aquaculture production in N.L. grew slowly in the 1980s and 1990s. During this period, the province lagged behind the other Atlantic Provinces and B.C. in the volume and value of aquaculture production. Since then, however, aquaculture in the province has experienced significant growth. In 2013, the latest year for which comparable data is available, N.L. had the second highest production value of aquaculture in Canada, accounting for 20% of the total, behind B.C. (53%). When considered by species, N.L. was the second largest producer of Atlantic salmon in Canada in 2013 and the second largest producer of Blue mussels.

In 2013, aquaculture production in N.L. reached a record, with 26,551 tonnes of finfish and shellfish produced, valued at \$197 million. This included 22,196 tonnes of finfish, valued at \$182 million, and 4,354 tonnes of shellfish, valued at \$15 million. Overall production volume rose by 25% over the previous year, while production value increased by 74%. The increase in volume was largely the result of increased production of Atlantic salmon; Blue mussel production remained relatively on par with 2012 production. The significant growth in value was the result of higher production volumes of Atlantic salmon, combined with strong prices

for both Atlantic salmon and Blue mussels. The development of the industry is strongly supported by the provincial government; by 2018, N.L. aims to increase production to 50,000 tonnes of salmonids and 6,000 tonnes of mussels.⁴⁰

4.2 Governance

4.2.1 General Framework

N.L. first became involved in aquaculture in 1988 with the signing of a MOU between the province and the federal government. This MOU outlines the roles and responsibilities of each level of government. The provincial Department of Fisheries and Aquaculture (NL-DFA) is responsible for aquaculture licensing, inspections, enforcement, and development and extension services and DFO is responsible for habitat protection. Shared responsibilities include environmental protection, aquaculture science, site inspection, and fish health.⁴¹ Through an additional MOU signed in 2008, N.L. and the three other Atlantic Provinces work collaboratively toward a harmonized aquaculture regulatory and policy environment framework in the region.⁴²

4.2.2 The Aquaculture Act

To govern the aquaculture industry, the province introduced the *Aquaculture Act*⁴³ and the *Aquaculture Regulations*⁴⁴ in 1988, which are the responsibility of NL-DFA. The *Act* and its associated regulations were amended on several occasions over the years. Currently, the purposes of the *Act* are to: promote the development of aquaculture;

39 Newfoundland Aquaculture Industry Association, [Newfoundland Mussel Producers the First and Only to Receive Organic Aquaculture Certification in North America](#), *News Release*, 21 February 2013.

40 Newfoundland and Labrador Department of Fisheries and Aquaculture, [Vision 2018: Sustainable Aquaculture Development – A Strategic Plan Discussion Document](#), 2013.

41 NL-DFA, [Provincial and Federal Responsibilities](#), *About the Department* [accessed 12 March 2015].

42 [Atlantic Provinces' Memorandum of Understanding for the Development of the Aquaculture Sector](#), 18 January 2008.

43 [Aquaculture Act](#), Chapter A-13.

44 [Aquaculture Regulations](#) under the *Aquaculture Act*, O.C. 96-939.

secure the property rights of the industry; minimize conflicts with competing interests and uses; and engage in cooperative decision-making within the province and with the federal government (section 3). The major areas addressed by the *Act* include: licensing, compliance and enforcement, and inspections, as well as activities related to escapes, waste management and aspects of aquatic animal health. More specifically, the *Act* addresses the following:

- A licence is required to conduct aquaculture activities, the term of which will not extend beyond the term of the lease of the right of occupancy on the land, which is a prerequisite to a licence being issued (subsections 4(1), (5) and (7));
- The Minister may establish criteria for shore fastened mooring at aquaculture sites (subsection 4.1(1)); the Minister may also require financial or other security for restoration of a site (section 4.2) and provides detailed requirements for restoration (section 4.3);
- The *Act* declares all aquatic plants and animals of the species specified in the licence, while within the boundaries of the licence, to be the exclusive property of the licensee until sold, traded, transferred or otherwise disposed of, and those aquacultured animals that have escaped remain their personal property while within 100 meters of the site boundary (section 5);



Northern Harvest Sea Farms is a large Canadian salmon aquaculture company that began operations in N.L. in 2008. The company was initially established in 1985 in N.B. where the company's head office is located. In October 2012, the company became the first salmon aquaculture operation in North America to receive the Global Aquaculture Alliance's Best Aquaculture Practices "three-star" certification. Senators visited one of its grow-out sites located in Pool's Cove.

- The Act also regulates disease reporting, introduction, transfer, transport, investigation and enforcement (sections 7 and 8); and
- The Regulations create requirements for the identification of aquaculture sites, including the placing of yellow buoys and mooring lines (section 4).

The N.L. *Aquaculture Act* defines “aquaculture” as:

“the farming of fish, molluscs, crustaceans, aquatic plants and other aquatic organisms with an intervention in the rearing process to enhance production by activities such as regular stocking, feeding, and protection from predation, and includes fallowing and processes to mitigate environmental degradation and the placement of necessary gear and equipment”.

4.2.3 Lease and Licence

As noted above, an aquaculture licence will not be approved unless the proposed licensee has first been granted a lease in accordance with the *Lands Act*.⁴⁵ The authority to lease an area of Crown land, including a land covered by water, rests with the provincial Department of Environment and Conservation. It was explained to the Committee that leases would only be approved for sites located away from registered salmon rivers and away from known areas of endemic pathogens. The aquaculture lease is authorized for a 50-year period.

The application for an aquaculture licence must include information on: site location and layout; species and strain; type of operation; a business plan; specific site information; and production and

harvest plans for the next five years. In addition, the application must disclose environmental concerns and/or conflicts and provide an assessment of the site’s water quality. In contrast to the lease term, the aquaculture licence for the operation of a grow-out site is generally granted for one year and must be renewed annually. Although the Minister of Fisheries and Aquaculture has, since the *Aquaculture Act* was amended in 2012, the authority to issue multi-year licences, this provision has not been used to date.

During the hearings, the Committee was told that it is a long-standing practice that the provincial government would not grant an aquaculture licence that would displace traditional fishing activities. The licensing process involves a referral to the fishermen’s union so that local fishing communities are aware of any aquaculture activity being proposed. This referral is part of a broader public consultation process that an aquaculture company is required to undertake in the community in which it wants to establish itself.

The licence application process is administered through a one-stop-shop via NL-DFA. Aquaculture applications are then channelled to all other relevant provincial and federal departments and agencies, including Transport Canada and DFO. DFO is responsible for reviewing new site applications and providing advice regarding siting and maximum production levels so as to minimize environmental impacts of aquaculture operations. Proposed aquaculture operations may, at the discretion of the Minister of Environment, be subject to an environmental impact assessment under the provincial *Environmental Protection Act*. The environmental assessment process also provides a procedure for public consultations.

45 *Lands Act*, Chapter 36.

Once established, licensed aquaculture operations must, as per the *Aquaculture Act*, maintain books and records. The *Act* provides for inspections of aquaculture operations to ensure compliance with the legislation/regulations, as well as with the licence conditions. Inspectors may act as peace officers and have broad powers to enter, inspect, seize and detain items. Following an inspection, inspectors may provide directives to a licence holder. It is an offence to violate a provision of a term or condition of a licence, the *Aquaculture Act*, its regulations, or a directive issued by an inspector.

4.2.4 Integrated Pest Management

In marine areas with low salinity (such as the Bay D’Espoir), the freshwater influence acts to mitigate sea lice infestation; certain aquaculture operations on the south coast of N.L. consequently may not be affected by sea lice. However, concurrently with the rapid expansion of the industry over the past decade, the occurrences of sea lice infestations on salmon grow-out sites have increased in some bays. During regular diagnostic and surveillance site visits, NL-DFA staff conducts sea lice counts.



Senators visited Cold Ocean Salmon’s hatchery in St. Alban’s, N.L. The company, which started salmon aquaculture operations in the province in 2006, is a subsidiary of Cooke Aquaculture, a large Canadian salmon aquaculture company founded in 1985 which also operates in N.B., N.S., P.E.I., the United States (Maine), Chile, Scotland, and Spain. In addition to its hatchery, Cold Ocean Salmon operates several grow-out sites in the Bay D’Espoir region as well as a processing plant in Harbour Breton.

In addition, aquaculture operators also carry out weekly sea lice counts. If sea lice numbers rise above the provincial trigger point, treatment will be sought by a licensed veterinarian. NL-DFA does not currently publish the results of its sea lice monitoring program.

The availability of chemotherapeutants (SLICE[®], Salmosan[®], and hydrogen peroxide) to control sea lice is limited and NL-DFA and industry are currently developing an integrated pest management program that will encompass a variety of new products and technologies for controlling sea lice, including cleaner-fish (cunner) and lasers. This would be in addition to current preventative practices like fish husbandry, single-year class stocking, fallowing, and low stocking densities.⁴⁶

4.2.5 Bay Management Area Policy

The first reported case of the ISA virus in a salmon aquaculture operation in N.L. was in 2012 and other cases of ISA outbreaks have been reported in the province since that time. The NL-DFA had been working with DFO and the salmon aquaculture sector on the development of BMAs since 2009, but the occurrence of ISA highlighted the need to further delineate and enhance these management areas. BMAs identify ideal locations for new sites, prescribe best practices (single-year class, one single stocking per site, specific fallowing periods per site, and common fallowing period per bay) along with strict biosecurity procedures. BMAs can also set a minimum distance between sites operated by the same company and another minimum distance between any sites operated by different companies. According to the NL-DFA,

the use of BMAs is a sound, scientifically based and proven method of reducing disease and parasite impacts. It also enables stable and orderly management of industry practices to ensure both environmental sustainability and cooperation between companies for the long term viability of the industry.⁴⁷ BMAs were made a condition of licence in January 2014. Each company growing Atlantic salmon within the province now has grow-out sites in three distinct BMAs to facilitate continuous stocking.

4.2.6 Containment and Recapture

The *Code of Containment for the Culture of Salmonids in Newfoundland and Labrador* is a joint NL-DFA, DFO and industry commitment; each has clearly defined roles and responsibilities.⁴⁸ The code was first implemented in 1999 and is updated on a regular basis. It establishes design standards for aquaculture cage systems and outlines the procedures industry must follow to mitigate escapes through site management. It has been observed that net damage caused by ice and storms is the leading cause of escape events in N.L. For this reason, the code insists on equipment and infrastructure (e.g., nets, cages, mesh size, moorings) that can withstand the rigours of the marine environment in which they are to be deployed. It also prescribes how the equipment must be tested and maintained. Other elements of the code of containment include handling practices, documentation and reporting, inspection, and mitigation. Adhering to the code is a condition of the aquaculture licence. Each marine grow-out site is inspected by NL-DFA for code compliance twice a year.

46 Newfoundland Aquaculture Industry Association, “[Newfoundland’s Aquaculture Industry Preparing for Increased World Demand while Planning Better Protection for Our Oceans](#)”, *News Release*, 10 March 2014.

47 NL-DFA, *Seafood Industry Year in Review 2013*, February 2014.

48 NL-DFA, *Code of Containment for the Culture of Salmonids in Newfoundland and Labrador*, March 2014.

The code also prescribes measures for the recapture of escaped fish. DFO is responsible for the monitoring and implementation of this section of the code. Authorization of recapture is at DFO's discretion or direction, in consultation with the aquaculture operator and other stakeholders, as needed. DFO will consider the life history stage of the escaped fish, the time of year, incident-specific factors, and conservation objectives for wild fish populations. Consequently, not all escape incidents will trigger recapture efforts even though all incidents must be reported. An incident involving the loss of 100 or more fish from any one cage is deemed to constitute a significant escape and the licence holder is required to commence discussions with DFO within 24 hours of the incident to determine if recapture efforts should be initiated.

NL-DFA publishes a report that outlines industry compliance with the requirements of the code and summarizes the outcomes of its inspection activities. The report also provides information on the number of escapes and effectiveness of recapture efforts. A report is released per calendar year and the most recent covers the year 2012.⁴⁹

4.2.7 Provincial Aquaculture Strategy

NL-DFA first developed a provincial aquaculture strategy in 1990. The strategy was reviewed in 2000 and again in 2005 when it was recognized that the aquaculture industry was expanding within the province. In 2014, following public consultations,⁵⁰ a new aquaculture strategy was released to "guide future policy and investment



Norlantic Processors Ltd. is a Blue mussel grower and processor based in Botwood, N.L. The company, which produces approximately one million pounds of mussels per year, was awarded the Canadian Organic Aquaculture Standard certification by Global Trust in 2013. In addition, its processing facility became certified to the Best Aquaculture Practices processing standard in January 2014. Senators visited one of the company's growing areas and toured its processing facility.

49 NL-DFA, *Annual Compliance Report – 2012 on the Code of Containment for the Culture of Salmonids in Newfoundland and Labrador*, March 2014.

50 NL-DFA, *A Summary of What We Heard: 2013 Aquaculture Consultations*, 2013.

decisions aimed at fostering the success of the industry”.⁵¹ The strategy focuses on three priorities considered critical to meeting the provincial goal of sustainable aquaculture development:

- The first priority relates to sustainable management, including issues related to fish health and environmental impacts. With respect to fish health, NL-DFA intends to further define the BMAs developed in 2009 through the collection and analysis of oceanographic and epidemiologic data. Fish health management plans will be revised and surveillance and biosecurity audits will continue to be conducted. With respect to environmental impacts, NL-DFA will implement best practices that mitigate site-specific impacts and will update the aquaculture licence applications to reflect new environmental monitoring requirements.
- The second priority deals with support capacity and encompasses financial programs, infrastructure planning, governance renewal, and communication. NL-DFA intends to review current federal and provincial financing programs that support the industry with a view to amending current or developing new financial tools available to the industry. Similarly, the department will identify current and future

aquaculture infrastructure needs for both the finfish and shellfish sectors. With respect to governance, NL-DFA will undertake a review of current regulations, policies and procedures for licensing aquaculture sites. With respect to communications, the department will work with the industry to effectively communicate the facts regarding aquaculture. Actions under this item include more regularly posting information about the industry, the creation of a Ministerial Advisory Council on Aquaculture that will consist of various stakeholders and provide a forum for dialogue on aquaculture in the province, and the development of a communications strategy.

- The third priority relates to research and development in three particular fields: aquatic animal health, exploration of new potential salmonid grow-out sites, and mussel aquaculture (seed supply, invasive species, species diversification, etc.). In addition, NL-DFA will establish an Aquaculture Research and Development Advisory Committee mandated to review current research and development activities and to provide recommendations for further collaboration among the research community.



Located in St. Alban's, N.L., the Centre for Aquaculture Health and Development (CAHD) officially opened in July 2011. The Centre is a modern laboratory that supports diagnostics and surveillance and the development of advanced biosecurity practices, as well as applied and clinical aquaculture health research. It provides veterinary advice, support, facilities and quarantine assistance to the aquaculture industry and acts as the province's main laboratory in the area of fish health and aquaculture. While at the CAHD, a presentation was delivered to Senators on the various activities performed there, but it was not possible to tour the facility due to biosecurity considerations.

CHAPTER 5: Nova Scotia

5.1 Profile of the Industry

5.1.1 Structure and Location

The aquaculture industry in N.S. is one of the most diverse in the country. The wide variability in climatic and oceanographic conditions (i.e. many protected coastal waters, areas with strong tidal currents, shallower waters) has encouraged the production of a large range of species grown for commercial purposes (see Table 5.1). In addition, the aquaculture industry has established finfish and shellfish operations in almost every county across the province, including several land-based facilities.⁵² The province is also home to a world-renowned land-based marine plant production facility (Acadian Seaplants Limited) which grows, harvests and processes seaweed for food, biochemical and agricultural markets.

The structure of the finfish sector has changed over the years. The sector started small and for many years was operated by small and medium-sized companies and was focussed on supplying local markets. While some of these companies continue to operate to this day, one salmon aquaculture company – Cooke Aquaculture – has expanded its operations vertically throughout the province to establish hatcheries, grow-out sites, processing plants, a feed mill (Northeast Nutrition), equipment manufacturing (cages and nets), as well as transportation and distribution services. The other finfish growers tend to be small-scale operators. For its part, the shellfish sector has remained fragmented and involves a large number of companies, including many small family-operated businesses.

Table 5.1 – Aquacultured Species in Nova Scotia

	Species
Finfish	<ul style="list-style-type: none">• Atlantic Salmon• Arctic Char• Rainbow/Steelhead Trout• Atlantic Halibut
Shellfish	<ul style="list-style-type: none">• Blue Mussel• Clam (Soft Shell, Hard Shell)• Oyster (American, European)
Aquatic Plants	<ul style="list-style-type: none">• Irish Moss• Seaweed• Dulse

Source: According to information provided to the Committee by DFO.

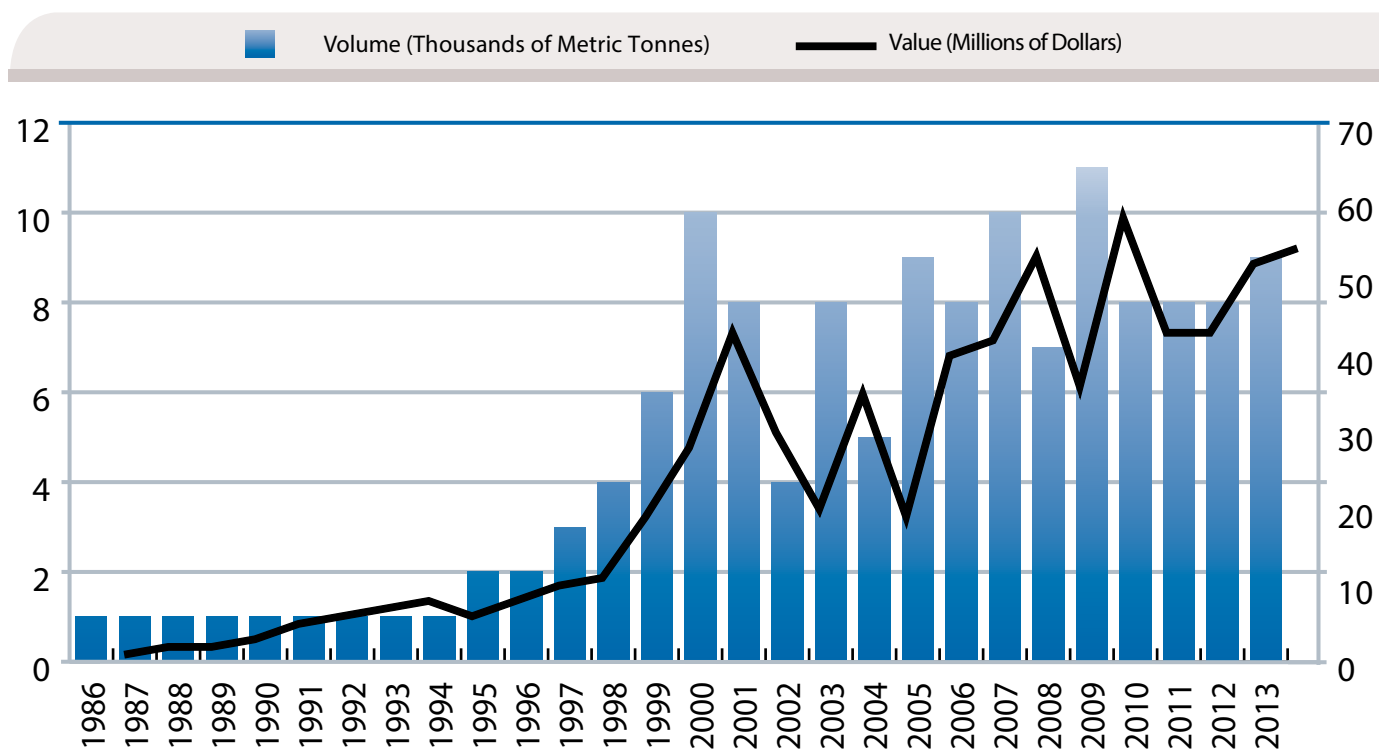
52 For the location of these aquaculture operations, see the following [map](#).

5.1.2 Production

As illustrated in Figure 5.1, aquaculture production in N.S. grew continually during the 1980s and 1990s, reaching a peak at 10,456 tonnes in 2000. A combination of favourable growing conditions and an abundance of suitable sites provided the basis for this growth. This was followed by a series of ups and downs in the production cycle. The

reasons given to explain these fluctuations include a complex regulatory framework, the high number of small operators, a lack of business and technical skills to operate a successful aquaculture venture, weak government support and poor public acceptance⁵³. Aquaculture production reached another peak in 2009, but this was followed by a decline in 2010 and 2011. Production started to grow again

Figure 5.1 –Aquaculture Production^a in Nova Scotia, Volume and Value,^b 1986 to 2013



Notes: a. Aquaculture production includes the amount and value produced on sites and excludes hatcheries or processing.

b. At farm-gate price. The farm-gate value represents a product's value once it is sold by the producer.

Source: Based on data from DFO, *Aquaculture – Production Quantities and Values* [accessed 12 March 2015].

53 Nova Scotia Department of Agriculture and Fisheries, *Long-Term Planning for Aquatic Farming in Nova Scotia – A Discussion Document*, February 2005.

in 2012, despite the fact that a number of grow-out sites were infected with the ISA and IPN viruses that year.

In 2013, the last year for which data is available, the N.S. aquaculture industry produced 8,748 tonnes of fish and shellfish, valued at \$54 million. This included 6,780 tonnes of finfish, valued at \$43 million, and 1,968 tonnes of shellfish, valued at \$11 million. As shown in Figure 5.2, Atlantic salmon is the most aquacultured species in the province (75.8%); Blue mussel is the most produced shellfish species (3.06%).

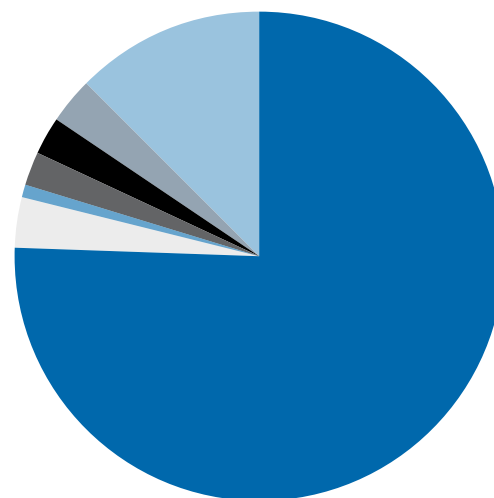
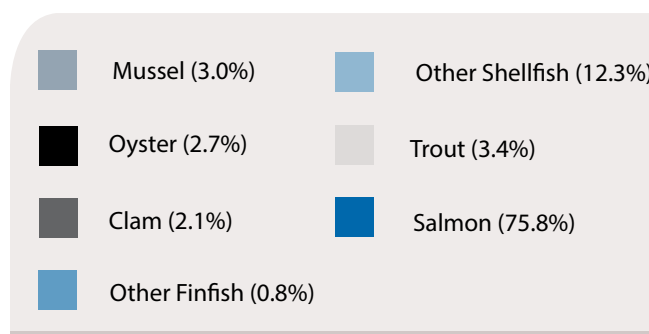
When compared to the other provinces, N.S. had the fourth highest production value of aquaculture in Canada in 2013, accounting for 6% of the total, behind B.C. (53%), N.L. (20%) and N.B. (13%). When considered by species, N.S. was the third largest producer of Blue mussels and the fourth largest producer of oysters.

5.2 Governance

5.2.1 General Framework

In N.S., a MOU on aquaculture development between the federal government and the province serves to establish the roles and responsibilities of each level of government as represented by the provincial Department of Fisheries and Aquaculture (NS-DFA) and DFO. Under this MOU, N.S. is identified as being the lead on licensing and leasing, site inspections and compliance, and fish health management. Both levels of government share in the responsibility for environmental management and monitoring. As noted previously, through an additional MOU signed in 2008, N.S. and the three other Atlantic Provinces work collaboratively toward a harmonized aquaculture regulatory and policy environment framework in the region⁵⁴.

Figure 5.2 – Nova Scotia Aquaculture Production by Species, Percentage of Value, 2013



Source: Based on data from DFO, *Aquaculture – Production Quantities and Values, 2013* [accessed 12 March 2015].

5.2.2 The Fisheries and Coastal Resources Act

The first Nova Scotia Aquaculture Development Strategy was drafted in 1996. That year, the *Fisheries and Coastal Resources Act* was passed.⁵⁵ Administered by NS-DFA, the *Act* is the primary piece of legislation governing aquaculture in N.S. The *Act* is an enabling piece of legislation and its purpose, among others, is to: “encourage, promote and implement programs that will sustain and improve the fishery, including aquaculture” and “assist the aquaculture industry to increase production” (subsections 2(b) and (d)).

Part V of the *Act* deals expressly with aquaculture. Aquaculture is prohibited without a licence and aquaculture on Crown land is further prohibited without a lease. Generally, an aquaculture licence carries with it the exclusive right to possession of the water column and sub-aquatic land of the

The N.S. *Fisheries and Coastal Resources Act* defines “aquaculture” as:

“the farming for commercial purposes of aquatic plants and animals over which the Minister exercises control but does not include raising or breeding in tanks, nets, pens or cages of aquatic plants and animals either as aquarium species, in laboratory experiments or by individuals on their own property as food for their own use.” (subsection 3(1)(a))

The *Act* further defines “farming” as:

“the culture, husbandry, production, development or improvement of aquatic plants and animals.” (subsection 43(h))

licence (section 44). The Minister of Fisheries and Aquaculture (the Minister) may refer the application for an aquaculture licence to a public hearing (subsection 48(c)).

Both a licence and a lease may be granted for an initial term of up to 10 years, with possible renewal terms of 5 years each (subsections 51(1)(e) and 52(2)(a)). The Minister has the power to designate aquaculture development areas as well as closed areas or areas not suitable for aquaculture development (subsections 56(1)(a) and (e)).

The *Act* addresses the issue of aquaculture products as property by designating all aquatic plants and animals of the species specified in a licence or lease in the leased or licenced area, except free-swimming or drifting flora and fauna not enclosed, as the exclusive property of the holder of the licence or lease (section 60). Further, escaped aquatic animals remain the exclusive property of the holder of the lease or licence while within 100 meters of the boundaries of the leased or licenced area (subsection 61(2)).

The *Aquaculture Licence and Lease Regulations* establish criteria for the location and marking of aquaculture lease sites (section 3) and list, as conditions of the licence, the requirements for reporting and recording with respect to disease, type of feed, veterinarian treatment, and information on the sale of aquacultured products (section 5). The Regulations also stipulate that the Provincial Fish Health Veterinarian may isolate, quarantine, order treatment for, restrict the movement of, or destroy cultured fish infected or thought to be infected with a disease that he/she considers a significant risk to wild or cultured fish stocks (section 9).⁵⁶

55 *Fisheries and Coastal Resources Act*, Chapter 25.

56 *Aquaculture Licence and Lease Regulations*, made under Section 64 of the *Fisheries and Coastal Resources Act*, chapter 25.

The Nova Scotia Aquaculture Development Strategy was revised in 2000, in 2005 and again in 2012.⁵⁷ Then in May 2013, NS-DFA announced that a new regulatory framework for aquaculture would be developed through public consultations led by the Doelle-Lahey Panel. The Panel was assisted by an advisory committee representing stakeholders and community interest groups including First Nations, the aquaculture industry, conservationists, environmentalists, fishermen, and municipalities. The Panel released a summary of issues identified by participants in public consultations in December 2013 and its final report was published in December 2014.⁵⁸ The final report recommended several changes in the

provincial governance of aquaculture with the aim of minimizing environmental risks, particularly in relation to marine finfish aquaculture, while at the same time maximizing the social and economic benefits derived from the industry. One of the main recommendations was the creation of a classification system under which coastal areas would be rated as green, yellow or red based on their relative suitability for finfish aquaculture. The report also recommended the creation of a standing regulatory advisory committee that would provide ongoing advice on the implementation of the proposed regulatory framework and its continued improvement.



Senators toured Cooke Aquaculture's grow-out sites in Saddle Islands, N.S. The company also operates several hatcheries, grow-out sites and processing plants, as well as one feed mill (Northeast Nutrition) in the province.

57 NS-DFA, *Aquaculture Strategy Creating Sustainable Wealth in Rural and Coastal Nova Scotia*, 2012.

58 Independent Aquaculture Regulatory Review for Nova Scotia (The Doelle-Lahey Panel), *A New Regulatory Framework for Low-Impact/High-Value Aquaculture in Nova Scotia*, December 2014.

In response to the Doelle-Lahey Panel report, the provincial government tabled amendments to the *Fisheries and Coastal Resources Act* in April 2015. These amendments include, among others:

- A purpose section that recognizes aquaculture as a legitimate use of the coastal resources and as an industry that brings positive and economic benefits to communities;
- More transparent and stronger environmental regulations;
- The creation of an independent review board that will make application decisions on leases and licences.⁵⁹

5.2.3 Environmental Monitoring

In 2002, NS-DFA established an Environmental Monitoring Program (EMP) for the marine

aquaculture industry to monitor the potential effects of aquaculture on bottom sediments.⁶⁰ Monitoring is conducted on both aquaculture sites and at reference stations through the collection of both qualitative (video) and quantitative (sediment and water analysis) data from coastal areas throughout the province. All sites in production are tested and those with larger production are given higher priority. Sites of potential concern are subject to repeated sampling and, if required, remediation action is implemented. In order to minimize the organic and inorganic loading from marine finfish aquaculture sites, aquaculture operators are required to monitor their level of sediment sulphide concentrations based on standard operating practices that were initially developed in N.B.



Founded in 1981 and headquartered in Dartmouth, N.S., Acadian Seaplants Limited is the largest biotech seaweed product manufacturer of its type in the world. The company is fully integrated and cultivates, harvests, and processes seaweed into products for plants, animals and people. Senators were given a presentation on Acadian Seaplants' operations at its head office.

59 Bill No. 95, *Fisheries and Coastal Resources Act (amended)*, 21 April 2015.

60 NS-DFA, *Environmental Monitoring Program Framework for Marine Aquaculture in Nova Scotia*, March 2011.

CHAPTER 6: Prince Edward Island

6.1 Profile of the Industry

6.1.1 Structure and Location

The aquaculture industry in P.E.I. comprises two sectors: finfish and shellfish. In contrast to B.C., N.B., N.L. and N.S., the vast majority of aquaculture production on the Island consists of shellfish production. The variety of species aquacultured in P.E.I. for commercial purpose is presented in Table 6.1. Research and grow-out trials are being undertaken for other shellfish species, such as soft shell clams, scallops, and quahogs.

As is the case in QC (see Chapter 7), P.E.I. does not have marine finfish grow-out sites (net cages). The estuaries that surround the Island are shallow and are not conducive to marine cage aquaculture due to seasonal temperature extremes. For this reason, the finfish aquaculture sector occurs in pond cages and land-based tank systems. Currently, the finfish aquaculture sector in P.E.I. consists of five hatcheries and one grower, predominantly located in the eastern and central part of the province. AquaBounty Farms is a land-based, contained research facility

located in Fortune, which produces genetically engineered Atlantic salmon eggs. Atlantic Sea Smolt Inc. operates an Atlantic salmon hatchery located in Souris; its production supplies smolt to Snow Island Salmon Inc., a salmon grower located in N.S. Northern Harvest Sea Farms, a marine finfish aquaculture company operating in both N.B. and N.L., has two Atlantic salmon hatcheries on the Island: the Cardigan Fish Hatchery⁶¹ and the Dover Fish Hatchery. Ocean Trout Farms, located in Brookvale, is a fully-owned subsidiary of Cold Water Fisheries Ltd. that produces Rainbow trout eggs. Halibut PEI Inc. is a land-based facility growing Atlantic halibut in Victoria; it purchases juveniles from the Scotian Halibut Hatchery in Clark's Harbour, N.S., and grows halibut using salt water sourced from underneath the Island through wells.

The province's shellfish aquaculture sector is dominated by the production of mussels. Mussel culture occurs on leases in many of the rivers and estuaries on the Island, but the majority of the growing areas are concentrated along the northern and eastern

Table 6.1 – Aquacultured Species in Prince Edward Island

	Species
Finfish	<ul style="list-style-type: none">• Atlantic Salmon• Atlantic Halibut• Steelhead/Rainbow Trout
Shellfish	<ul style="list-style-type: none">• American Oyster• Blue Mussel

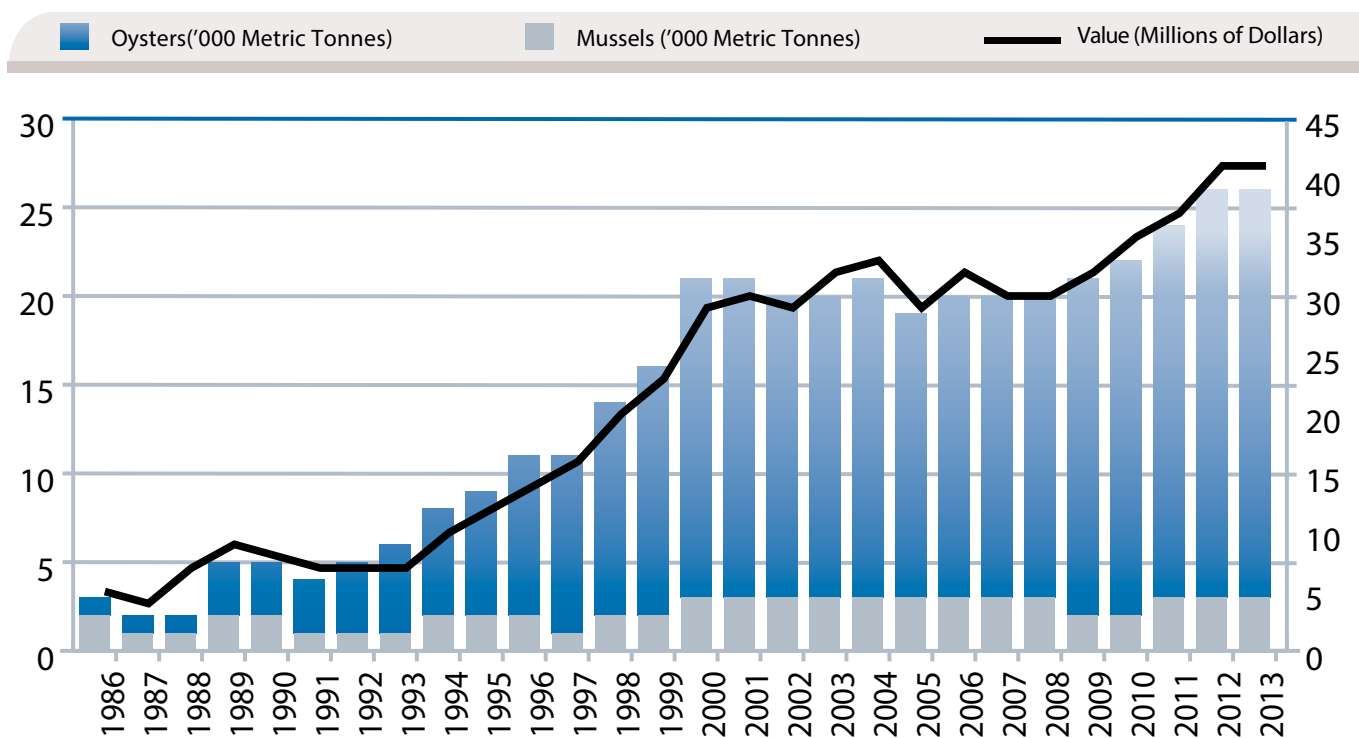
Source: According to information provided to the Committee by DFO.

61 The Cardigan Fish Hatchery was established on the Island by the federal government in the 1930s and was operated by the University of P.E.I. in the past.

coasts. There are 130 mussel growers whose cultivation areas cover 11,000 acres. Mussels on the Island are grown in off-bottom systems in which they are held in suspension in socks or mesh sleeves. They take 12 to 24 months to reach market size and they are harvested during every season, even

when under ice during the winter. The abundance of natural seed (or spat) found in the waters around the Island eliminates the need for spat hatcheries and artificial feeding. The mussel seed is therefore collected naturally using collector lines suspended in the water column.⁶²

Figure 6.1 – Aquaculture Production^a in Prince Edward Island, Volume and Value,^b 1986 to 2013



- Notes: a. Aquaculture production includes the amount and value produced on sites and excludes hatcheries or processing.
- b. At farm-gate price. The farm-gate value represents a product's value once it is sold by the producer.

Source: Based on data from DFO, *Aquaculture – Production Quantities and Values* [accessed 12 March 2015].

62 Based on information available on the website of the [PEI Aquaculture Alliance](#).

The oyster sector is concentrated on the north and south shores of the Island. There are currently 580 lease holders, occupying 7,100 acres, with 1,475 acres for off-bottom (or suspended) culture and close to 6,000 for bottom or seabed culture. Like mussels, cultured oysters are harvested year around. It takes between 2 to 5 years to grow oysters, depending on their size. Like the mussel sector, the province's oyster aquaculture sector is dependent on the collection of natural seed (in contrast to British Columbia where oyster growers mainly purchase seed from hatcheries). There are several sites in P.E.I. where wild oyster seed is collected commercially.⁶³

6.1.2 Production

As can be seen from Figure 6.1, total aquaculture production in P.E.I. grew continually between 1986 and 2000, after which it stabilized to approximately 20,000 metric tonnes per year until 2008. The annual aquaculture production grew again starting in 2008 and reached a peak in 2013. That year, production volume amounted to 25,706 metric tonnes, for a farm-gate value of \$41.2 million.

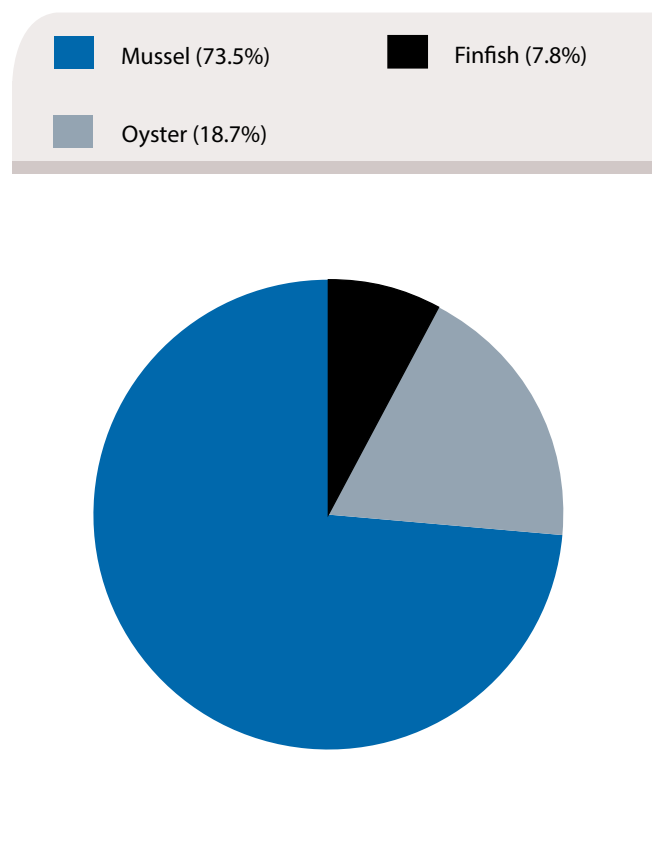
As illustrated in Figure 6.2, aquaculture production in P.E.I. is dominated by Blue mussel (73.5%). In fact, the province is the largest producer of mussels in Canada. The American oyster is the second most valued shellfish species grown in P.E.I. (18.7%) and the province is the second largest producer of oysters in Canada, behind B.C.

6.2 Governance

6.2.1 General Framework

Unlike the situation in the other provinces, P.E.I. does not have a provincially-based regulatory framework for aquaculture. DFO has the primary

Figure 6.2 – Aquaculture Production in Prince Edward Island by Species, Percentage of Value, 2013



Source: Based on data from DFO, *Aquaculture – Production Quantities and Values, 2013* [accessed 12 March 2015].

63 Ibid.

regulatory authority to manage aquaculture on the Island. This authority is exercised through sections 7 and 58 of the *Fisheries Act*.⁶⁴ Unlike B.C., where DFO is also the main regulator, there are no regulations issued under the *Fisheries Act* to specifically govern aquaculture in P.E.I. The federal authority in this area dates back to an MOU between the federal and provincial governments signed in 1928, which granted the federal government authority to issue leases for the purpose of oyster aquaculture. The MOU was renewed in 1987; it identifies DFO as the lead agency for the administration of aquaculture leasing in the province and outlines the elements of “a mutual regime for development and regulation of commercial aquaculture” in P.E.I.⁶⁵ However, the provincial department – Fisheries, Aquaculture and Rural Development (PEI-FARD) – has certain rights and obligations, some of which may be found in the provincial *Fisheries Act*.⁶⁶

DFO’s PEI Aquaculture Leasing defines aquaculture as “a sector of fisheries that includes the rearing or raising under controlled conditions of aquatic products such as oysters, mussels, fish and other aquatic resources, in seas, bays and rivers.”

The provincial *Fisheries Act* defines aquaculture as “the culture and husbandry of aquatic flora or fauna.”

Accordingly, aquaculture regulation in P.E.I. is achieved through a co-management approach that

includes DFO’s PEI Aquaculture Leasing Division and PEI-FARD’s Aquaculture Division. Representatives from the two divisions participate in the Aquaculture Leasing Management Board (ALMB), which also includes members of the aquaculture industry. The ALMB is responsible for the overall management of aquaculture in P.E.I.⁶⁷ Acting on the advice of the Board, the PEI Aquaculture Leasing Division specifies under what conditions leases may be issued, as well as how and why terms of contracts may be extended and under what conditions leases may be cancelled. The PEI Aquaculture Leasing Division is also assisted in its work by the PEI Aquaculture Leasing Referral Committee (LRC), which reviews applications for aquaculture leases. The membership of the LRC is broader than that of the ALMB and includes federal representatives from DFO (Conservation and Protection, Habitat, and Resource Management), Transport Canada (Navigable Waters Protection), and Environment Canada (Canadian Wildlife Service), as well as provincial representatives from PEI-FARD and Environment.

As mentioned previously, through an additional MOU signed in 2008, P.E.I. and the three other Atlantic Provinces work collaboratively toward a harmonized aquaculture regulatory and policy environment framework in the region.⁶⁸

6.2.2 Zoning and Leasing

In 1987, DFO adopted the *PEI Aquaculture Zoning System*, a document that designated zones where shellfish aquaculture operations could be located⁶⁹.

64 *Fisheries Act*, R.S.C., 1985, c. F-14.

65 No aquaculture licence is issued in PEI. Shellfish aquaculture operators are issued a lease and finfish operators a permit.

66 *Fisheries Act*, Chapter F-13.01.

67 The Board does not discuss individual aquaculture lease applications.

68 *Atlantic Provinces’ Memorandum of Understanding for the Development of the Aquaculture Sector*, 18 January 2008.

69 This document was developed by a steering committee formed of federal and provincial departmental representatives that had jurisdiction or an interest in aquaculture, including representatives of DFO, the Coast Guard, Public Works and Government Services Canada, Environment Canada, and Parks Canada at the federal level, and PEI-FARD, Environment and Tourism at the provincial level.

The zoning system took into account environmental considerations, wildlife sanctuaries, Aboriginal rights, landowner (riparian) rights, and potential conflicts that could arise with other users (e.g., commercial fisheries, recreational boating and other marine activities). It is believed that the zoning system has created a balance between areas for aquaculture development and other marine activities and has contributed to good public acceptance of the industry. The *PEI Aquaculture Zoning System* was subject to a review in 2008 and was revisited again in 2011 to ensure that it remains reflective of the current environment in the water systems across the Island, as well as other considerations. Areas are currently designated as follows:

- acceptable for both bottom and water column culture;
- acceptable for bottom culture and conditional for off bottom culture;
- acceptable for bottom culture but not for water column;
- conditional for both bottom and off bottom culture;
- conditional for bottom culture and not acceptable for water column culture;
- not acceptable for either bottom or water column culture;
- acceptable for bottom culture and conditional for off bottom oyster culture; and
- not acceptable for bottom culture and conditional for off bottom oyster culture.

The *PEI Aquaculture Zoning System* is a key document utilized by DFO's PEI Aquaculture Leasing Division, which carries out a preliminary screening of all aquaculture lease applications. The Division acts as a one-stop agency and coordinates the work of LRC members. Once the application has passed through the initial screening process⁷⁰, it is submitted, with all supporting data, to the LRC. There is no specific timeline for the review of lease applications; the complexity of the application and site requested determine the processing turnaround time. The LRC is also guided in its work by the *Prince Edward Island Aquaculture Leasing Policy*.⁷¹ This policy provides guidelines with respect to the issuance and management of aquaculture leases in the province. Appendix 7 of the policy describes the criteria to be used by the LRC in the review of lease applications. These criteria refer to navigation issues, past performance of the applicant/leaseholder, water depths, water quality, other water users, proximity to other fisheries, upland use, quantity of shellfish, carrying capacity, and environmental considerations.

Following its review, the LRC makes a recommendation for support or rejection, or support with conditions, to the PEI Aquaculture Leasing Division. DFO reserves the right to make the final decision on applications. Aquaculture leases are issued for a term of up to 25 years, reviewed every 5 years, with options for renewal. Three categories of leases may be issued:

- The *bottom culture lease* is for use of the bottom or seabed to cultivate shellfish species (such as oysters);

70 The applicant must provide information including location of site, site dimensions, a digital map showing location of site, species to be cultivated, a site development plan showing the proposed site and utilization at full production.

71 ALMB, *Prince Edward Island Aquaculture Leasing Policy*, July 2011.

- The *water column (or off-bottom) lease* is a bottom lease with permission to use the water column to grow shellfish (usually for mussels, but increasingly used for oysters). Leaseholders who have a bottom culture lease but wish to conduct off-bottom (or water column) culture must make an application to place structures in the water above the lease;
- The collection of wild spat or seed is considered a fishery and requires a licence under the federal *Fisheries Act*; sites used for the collection of wild seed also require the issuance of a *spat collection licence* from the PEI Aquaculture Leasing Division.

The lease contract requires the aquaculture operator to mark the lease site. In the case of bottom culture leases, corner markers outlining the boundaries of the lease must be permanently fixed. The lease contract provides for ownership of

the shellfish species within the lease boundaries and allows for the use of the seabed or water column to cultivate the approved species. A leaseholder also has the right to transfer, bequeath, sublet or cancel his/her lease. There are a number of leasing fees associated with acquiring permission to operate and maintain an aquaculture lease (application, renewal, transfer, mortgage assignment, wills/bequeaths, appeal, addition or deletion of a species, reconfiguration of leases, and more.).

Aquaculture lease operations go through a series of phases. The first five years of the lease is the developmental phase during which the aquaculture operator assesses the biological and environmental aspects of a proposed site prior to entering full-scale commercial operations. It also allows the PEI Aquaculture Leasing Division time to assess the performance of the leaseholder. If the operator is successful in developing the site in



Senators toured Atlantic Aqua Farms' processing facility located in Orwell Cove, P.E.I. Atlantic Aqua Farms operates seven suspension method mussel growing sites in the area and received the Best Aquaculture Practices certification in 2013.

accordance with the site development plan and meets the obligations in the lease contract, the lease is then considered to be in the commercial phase.

Two issues have recently surfaced regarding the aquaculture lease policy. One of them relates to the “Add a Species Policy” promoted by the ALMB in 2014. The policy allows leaseholders the opportunity to grow and harvest more than the species that their lease is designated for, so they can diversify their production (such as adding an oyster species to a mussel lease). That said, some have raised the concern that the conversion of large amounts of acreage into growing oysters would directly compete with existing oyster growers and wild oyster harvesters and that this would increase the supply of oysters on the market and drive oyster prices down. Consequently, the “Add a Species Policy” has been temporarily suspended.

The other issue relates to a moratorium on water column mussel leases that has been in place since 1999. DFO is currently studying the viability of removing the moratorium in order to lease an additional 1,500 acres to grow mussels in Malpeque Bay. Concerns have been raised regarding the structures that would have to be placed in the water above the mussel leases as this could create conflicts with other users in the area (oyster growers, lobster fishermen, and more). It is also felt that an increase in the level of mussel aquaculture in Malpeque Bay could contribute to a decline in natural oyster production in the Bay due to nutrient competition.

6.2.3 Monitoring and Compliance

Aquaculture operators are required to submit an “annual lease report” to DFO’s PEI Aquaculture Leasing Division, indicating the extent of operations

conducted (such as harvest information, the number of shellfish remaining on site after harvest, the quantity of seeds placed on-site, the time spent operating the lease, any problems encountered and any enhancements to bottom culture sites). They should be prepared to provide documentation to verify the activities conducted in support of their annual lease report. Annual lease reports may be subject to a random audit. Failure to submit the annual lease report may result in cancellation of the lease. Aquaculture operators are also subject to periodic review to ensure compliance with terms and conditions of the lease contract and to demonstrate that the lease is being utilized as per the site development plans. The operator may be requested to be present during a site review. DFO’s PEI Aquaculture Leasing Division may cancel a lease where the operator failed to develop the lease as per the site development plan.

6.2.4 Environmental Monitoring

A recent report suggests that the shellfish aquaculture sector in P.E.I. is not subject to provincial EIA.⁷² It should be noted, however, that the sector must operate in accordance with one industry code, the *Shellfish Aquaculture Environmental Code of Practice* (SAECOP), prepared by the Prince Edward Island Aquaculture Alliance (PEIAA). SAECOP outlines aquaculture practices that are anticipated to ensure environmental responsibility. All shellfish growers with aquaculture leases now adhere to the SAECOP. Items encompassed by the code include, but are not limited to: site planning, introductions or transfer of live shellfish, site maintenance, biofouling control, wildlife encounters, and waste management.

In addition, the *Prince Edward Island Aquaculture Leasing Policy* (discussed in section 6.2.2) requires

72 East Coast Environmental Law, *Comparative Analysis of Five Aquaculture Regulatory Frameworks in Canada*, prepared for the Independent Aquaculture Regulatory Review for Nova Scotia (Doelle-Lahey Panel), 15 April 2014.

the establishment of an Adaptive Management Committee. Its mandate is to review monitoring and research activities annually with a view “to recommend the direction and implementation of required environmental actions” to the ALMB and DFO.⁷³ Accordingly, recommendations can be

made to adapt or adjust aquaculture management and policy in response to a changing environment or in light of new scientific knowledge regarding the environmental impact of shellfish aquaculture operations. The Adaptive Management Committee is mandated to meet a minimum of twice per year.



Senators visited Halibut PEI, a land-based recirculation facility in Victoria, P.E.I., growing Atlantic halibut. The company purchases juveniles from Scotian Halibut Limited – a hatchery located in Clark’s Harbour, N.S. – and grows halibut in tanks using salt water sourced from deep saltwater wells.

CHAPTER 7: Québec

7.1 Profile of the Industry

7.1.1 Structure and Location

In QC, unlike most of the other provinces (B.C., N.B., N.S. and N.L.), the marine aquaculture industry produces only shellfish and aquatic plants. Finfish aquaculture takes place exclusively in freshwater. Finfish are not grown in seawater because the biophysical characteristics (salinity and water temperature, limited availability of protected areas, harsh winters with drifting ice and winds) restrict the industry's options in many coastal regions of the province. Few locations are protected enough for operating marine grow-out sites year-round. While year-round aquaculture in net cages in seawater is undoubtedly possible in some protected bays, the production cycle would be longer (over three years), putting QC's

industry at a disadvantage as compared to that of other provinces. In the late 1980s and early 1990s, companies did try to raise salmonids at sea in the province, but they encountered other problems, such as a lack of high-quality juvenile stocks and difficulty controlling disease, in addition to the harsh environmental conditions.⁷⁴

Table 7.1 lists the species being cultured in QC. The freshwater finfish sector mainly uses fully or partially closed containment systems (tanks and ponds) and raises salmonids such as rainbow trout and brook trout. While finfish aquaculture is underway in various parts of the province, it is concentrated in Estrie, Mauricie and Chaudière-Appalaches regions. In 2012, the sector comprised 88 companies and 169 employees.⁷⁵ It consists mainly of small, family-owned businesses.

Table 7.1 – Aquacultured Species in Québec

	Species
Finfish	<ul style="list-style-type: none">• Arctic Char• Brook Trout• Lake Trout• Rainbow Trout
Shellfish	<ul style="list-style-type: none">• Blue Mussel• Softshell Clam• Sea Scallop/Icelandic Scallop• Atlantic Oyster
Aquatic Plants	<ul style="list-style-type: none">• Seaweed

Source: According to information provided to the Committee by DFO.

74 Société de développement de l'industrie maricole Inc., *Atelier sur l'élevage de poissons marins au Québec – Compte rendu*, 16 and 17 November 2004.

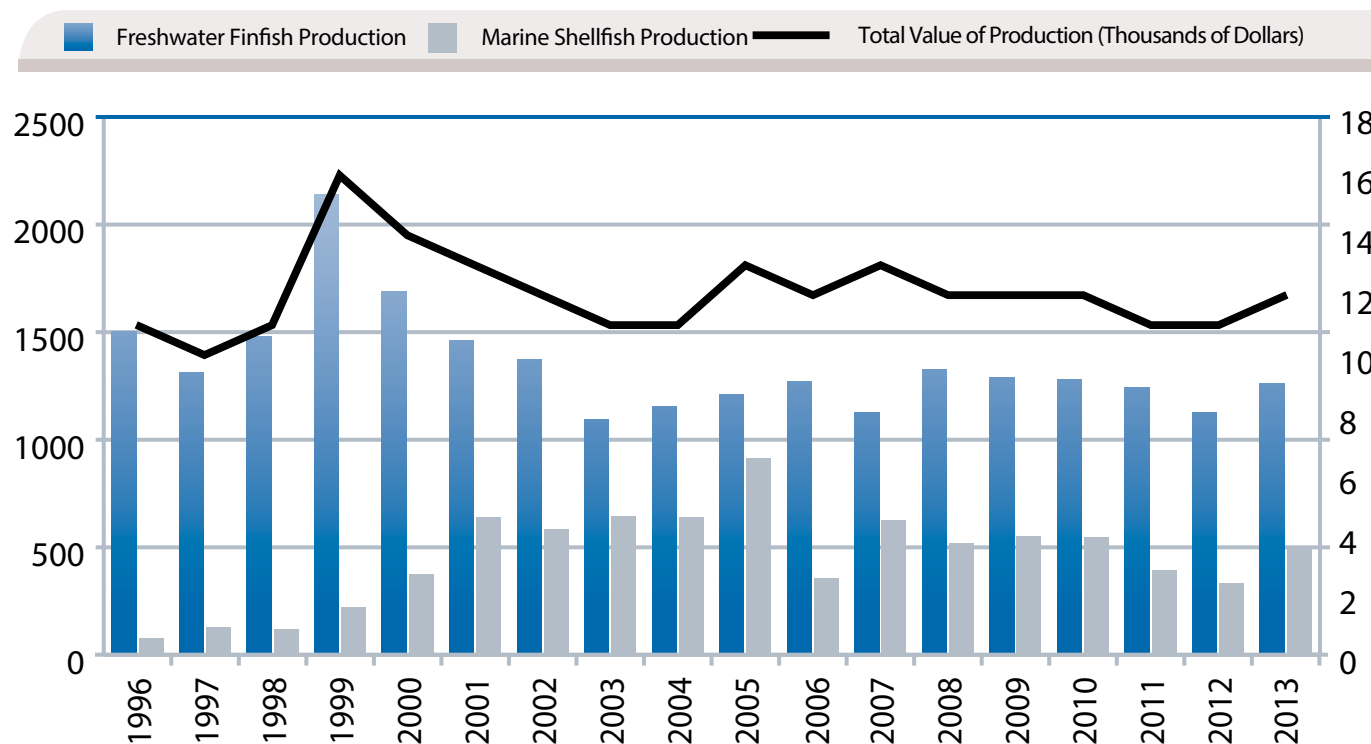
75 Comité sectoriel de main-d'œuvre des pêches maritimes, *Diagnostic de la main-d'œuvre de l'industrie des pêches et de l'aquaculture commerciales au Québec*, March 2014.

As for the marine aquaculture sector, operations grow mussels and scallops and are located in four regions: the Gaspé Peninsula (20 grow-out sites), the Magdalen Islands (12 sites), the North Shore (8 sites) and the Lower St. Lawrence (5 sites).⁷⁶ Production of Atlantic oysters ceased in 2006. Production of softshell clams is still in the pilot project phase. In 2012, the marine aquaculture sector comprised

27 companies and 118 employees.⁷⁷ Again, these are mainly small, family-owned businesses.

Finally, aquatic plant cultivation recently began in QC. In 2014, a company on the Gaspé Peninsula (Fermes marines de Gaspé Inc.) started growing seaweed for commercial purposes alongside its scallop culture.

Figure 7.1 – Aquaculture Production^a in Québec, Volume and Value,^b 1996 to 2013



Notes: a. Aquaculture production includes the amount and value produced on sites and excludes hatcheries or processing.

b. At farm-gate price. The farm-gate value represents a product's value once it is sold by the producer.

Source: Based on data from DFO, *Aquaculture – Production Quantities and Values* [accessed 12 March 2015].

76 For the location of these sites, see the following maps: [Gaspé Peninsula](#), [Magdalen Islands](#), [North Shore](#), and [Lower St. Lawrence](#).

77 Comité sectoriel de main-d'œuvre des pêches maritimes, *Diagnostic de la main-d'œuvre de l'industrie des pêches et de l'aquaculture commerciales au Québec*, March 2014.

7.1.2 Production

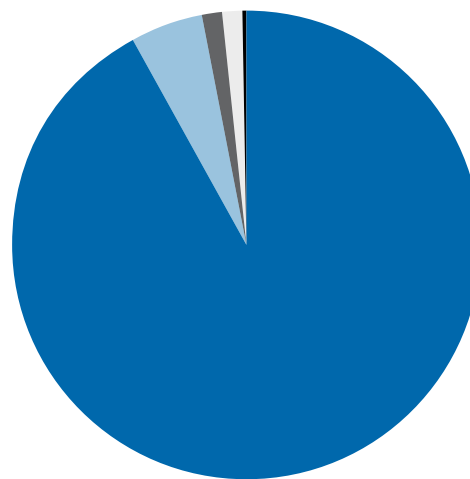
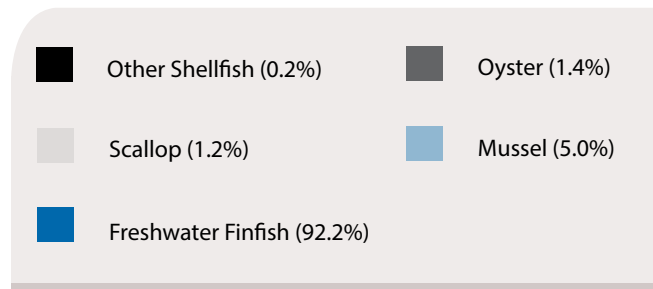
Figure 7.1 shows trends in the volume and value of the QC aquaculture industry's production from 1996 to 2013. Freshwater finfish production reached a peak of 2,139 tonnes in 1999. It then began to gradually diminish in 2000, following the emergence of environmental concerns about finfish aquaculture. The resulting pressures led a significant number of companies to shut down. In 2013, the finfish sector produced 1,263 tonnes of fish worth \$10.9 million.

Production in the marine aquaculture sector increased continually from 1996 to 2005, to reach a peak of 915 tonnes. However, the sector faced a number of financial (lack of investment), environmental (poor spat collection and predation by sea ducks) and commercial (poor marketing) challenges thereafter. In 2012, production was only 316 tonnes – the lowest since 2006 – and valued at \$0.5 million. In 2013, the situation improved and production increased by 55% to reach 491 tonnes, while value increased by 80% to reach \$0.9 million.

In total, QC's aquaculture industry produced 1,754 tonnes of fish and shellfish worth \$11.8 million in 2013. This was only 1% of the value of Canadian aquaculture production. QC is therefore a minor player in the industry.

As Figure 7.2 shows, the freshwater finfish sector is the largest component of QC's aquaculture industry, and much of its production (almost 70%) is used for restocking purposes⁷⁸. Aquacultured finfish intended for sale are sold on local markets. In the marine aquaculture sector, mussels are the most-produced species. Part of the mussel production is sold on local markets, but a substantial portion is resold by P.E.I. companies.

Figure 7.2 – Aquaculture Production in Québec by Species, Percentage of Value, 2013



Source: Based on data from DFO, *Aquaculture – Production Quantities and Values, 2013* [accessed 12 March 2015].

78 Restocking refers to the raising of fry to restock lakes for wild fishing.

7.2 Governance

7.2.1 General Framework

The regulation of aquaculture is in large part a responsibility of the provincial Department of Agriculture, Fisheries and Food (MAPAQ) and DFO. The MAPAQ is the one-stop agency for aquaculture in QC. It helps businesses develop their plans and assists in drafting their licence applications. The MAPAQ and DFO coordinate and process applications with the other relevant authorities. The process involves a large number of departments. At the provincial level, the Department of Forests, Wildlife and Parks must grant its approval to ensure the conservation and development of wildlife and its habitat; the Department of Sustainable Development, the Environment and the Fight Against Climate Change is responsible for issuing aquaculture leases for waters on Crown lands; and finally, the MAPAQ issues marine aquaculture and freshwater aquaculture licences. At the federal level, Transport Canada must give its approval under the *Navigation Protection Act*, Environment Canada must approve the location pursuant to its shellfish waters classification and, finally, DFO must grant its approval in the case of harmful alteration, disruption or destruction of fish habitat under the *Fisheries Act* and issue a number of permits and licences, including introduction and transfer permits, fishing licences, and permits for activities affecting a species at risk. The assessment process for aquaculture site applications has no prescribed deadline.

7.2.2 The Act Respecting Commercial Aquaculture

QC's aquaculture industry is subject to the *Act Respecting Commercial Aquaculture*,⁷⁹ adopted in 2004, and the Commercial Aquaculture

Regulation.⁸⁰ Under the *Act*, no person may carry out commercial aquaculture activities unless the person holds a licence issued by the MAPAQ. This licence is non-transferable, valid for 10 years and may be renewed for the same period.

The Regulation sets out the conditions for obtaining a licence. In their applications, companies must provide information on the location of the site, the facility layout plan, the species that will be raised, the production method, the biomass involved, the

Under Quebec's *Act Respecting Commercial Aquaculture*, "aquaculture" is defined as "the cultivation or raising of aquatic organisms, in particular fish, amphibians, echinoderms, shellfish, crustaceans or plants, except organisms cultivated or raised for aquarium fishkeeping purposes."

length of the production cycle, etc. The *Act* enables the MAPAQ to subject licence applications to public consultations. All the information included in a licence is kept in a registry and is publicly available.

The Regulation includes development and yield standards. Aquaculture companies must occupy and operate their sites in a continuous manner until they reach the proposed maximum production volume, as provided in the licence application, except in unforeseeable or uncontrollable circumstances.

Under the *Act*, companies must keep books on their ongoing production operations and provide them to MAPAQ upon request. The Regulation prescribes the information that must be entered in the books, which includes information on the

79 *An Act Respecting Commercial Aquaculture*, Chapter A-20.2, s. 42.

80 *Commercial Aquaculture Regulation*, an Act Respecting Commercial Aquaculture, Chapter A-20.2, s. 42.

feeding and health of the aquatic organisms being raised, the medication or vaccines administered and the cleaning products, disinfectants and pest control products used. Companies must also submit an annual report on their activities to the MAPAQ.

The *Act* provides for inspections of aquaculture sites and reviews of the documents kept by companies while carrying out their activities. In the performance of their duties, inspectors have the powers of a peace officer. Persons who contravene the conditions of their licence, the *Act* or its Regulation are liable to pay a fine that varies with the type of offence.

The *Act* authorizes the MAPAQ to establish regional aquaculture development frameworks “to facilitate the ordered growth of aquaculture.” In 1996, the MAPAQ adopted its first marine aquaculture development strategic plan. The plan focused on shellfish production, particularly the Blue mussel and the sea scallop. The plan’s emphasis was placed

on the development of companies’ production capacities. Another five-year development plan was released in 2006, in collaboration with aquaculture industry stakeholders. This plan, which is currently under review, focuses on consolidating aquaculture companies, increasing productivity and marketing the industry’s products.⁸¹

In 2008, the MAPAQ committed to preparing a marine aquaculture development framework for the Magdalen Islands.⁸² The goal is to establish aquaculture zones where marine aquaculture would be the accepted priority while preserving marine heritage. The framework would also promote orderly, coordinated and standardized marine aquaculture development in the region and facilitate the application of the regulatory process. Consultations were held with producers, DFO, Transport Canada, the commercial fishing industry, and other stakeholders to introduce the plan and to agree on the zones in question.



Fermes marines du Québec Inc. is involved in the production of scallops and operates a hatchery in Newport and several grow-out sites in Gaspé, QC. Senators were given a tour of the hatchery, a state-of-the-art facility which uses saltwater and is entirely automated with touchscreen panels located in different rooms. Last year, the company started growing seaweed for commercial purposes alongside its scallop culture.

81 Société de développement de l’industrie maricole (SODIM) and Table maricole, *Plan stratégique de développement de la mariculture 2006-2011*, 2006.

82 Meggie Desnoyers, *Projet de cadre de développement aquacole – un survol*, MAPAQ, 11 mars 2014.

A report on the consultations is expected to be completed in early 2015.

As for the finfish aquaculture sector, in 2003 the MAPAQ adopted a sustainable development strategy for freshwater aquaculture, the *Stratégie de développement durable de l'aquaculture en eau douce au Québec*.⁸³ The strategy helps finfish companies limit phosphorus discharges into the environment and is still in effect. Participating companies committed to meeting the environmental target of 4.2 kg of phosphorus discharges per tonne of annual production by 31 December 2014 (compared with an average of 7.2 kg in 2003). The strategy mainly targets finfish operations producing over five tonnes a year, and participation is voluntary. To date, 26 companies have begun monitoring their phosphorus discharges to determine whether they are meeting the objective, and one company reached the target in 2013–2014.⁸⁴ The Association des aquaculteurs du Québec argues that the phosphorus discharge target for freshwater aquaculture producers is the toughest in Canada and will consequently limit the expansion of existing finfish operations and the number of new ones.⁸⁵

More recently, under the provincial industrial development policy entitled *Plan de Développement Sectoriel en Aquaculture Commerciale*, the MAPAQ committed to taking more action to ensure the economic and environmental viability of the aquaculture industry, including the freshwater finfish and marine shellfish sectors.⁸⁶

7.2.3 The Société de développement de l'industrie maricole inc.

The SODIM is a not-for-profit corporation established in 1997 to support the development of a profitable and competitive marine aquaculture sector in QC. It is funded by the MAPAQ and other federal and provincial departments and agencies. The SODIM provides financial assistance to marine aquaculture companies for their start-up, consolidation and expansion phases (investment funding of \$7.5 million). Today, it is involved in financing nearly all the marine aquaculture companies operating in QC. The SODIM also provides technical assistance and advice to these companies. Moreover, between 2002 and 2011, the SODIM directed and funded research and development and promoted technology transfer in areas of interest to the marine aquaculture sector (research funding of \$9 million).⁸⁷

In 2010, the SODIM created the Aquamer fund through a \$4-million interest-free loan from Canada Economic Development, repayable over 15 years. This funding has enabled companies to acquire, repair or replace major equipment necessary for their operations.

83 MAPAQ, *Stratégie de Développement Durable de l'Aquaculture en Eau Douce au Québec*, November 2003.

84 MAPAQ, *Rapport annuel de gestion 2013-2014*, Government of Quebec, 2014.

85 Association des aquaculteurs du Québec, *Mémoire présenté dans le cadre de la Consultation sur le projet de Plan de développement durable du Québec*, 15 February 2005.

86 MAPAQ, *Plan de Développement Sectoriel en Aquaculture Commerciale*, 2010.

87 Since 2011, the Centre d'innovation de l'aquaculture et des pêches du Québec – **Merinov** – has supported research and development in the aquaculture industry.

CHAPTER 8: Economic Repercussions, Opportunities and Challenges

During the hearings, two studies evaluating the economic repercussions of the aquaculture industry in Canada were brought to the attention of the Committee. Reference was also made to a third study that examined the opportunities and challenges facing the industry. The main findings of these studies are summarized below.

8.1 Economic Repercussions

In 2014, the government of N.L. completed a study on the economic impacts of aquaculture in the province. This study explained that, in addition to producing its own output, the aquaculture industry triggers activity elsewhere in the economy. This activity can be divided into three categories – direct, indirect and induced impacts. The direct impacts are those associated with hatchery and grow-out activities. Indirect impacts estimate the activities generated by other industries that provide goods and services to the aquaculture industry, such as net cleaning, diving services, equipment maintenance and repair, equipment manufacturing, feed, packaging supplies, and transportation. Induced impacts account for all spending that occurs in the economy

generated from individuals employed in direct aquaculture operations and in indirect industries; these individuals spend their income in other areas of the economy on items such as cars, housing, and other retail goods. In the study, both indirect and induced impacts were combined to obtain what is called “spin-off impacts.” These economic impacts were measured using three key indicators: Gross Domestic Product (GDP), employment, and labour income. GDP by an industry corresponds to the value generated from its production less the value of the inputs required in the production process. Employment refers to the number of workers employed in the industry and is generally measured in full-time equivalent jobs (FTEs) per year. Labour income represents the salaries and benefits earned by workers in the industry. Overall, the study estimated that the aquaculture industry generated \$104 million in GDP in N.L. in 2013, with \$66 million in direct GDP and \$38 million in spin-off impacts (see Table 8.1). The industry created 406 direct FTEs, with an overall employment impact of 872 FTEs. It generated direct labour income of \$13 million, with an overall income impact of \$37 million.

Table 8.1 – Economic Impacts of Aquaculture in Newfoundland and Labrador, 2013

Production Value: \$197 Million	GDP (\$ Millions)	Employment (FTEs)	Labour Income (\$ Millions)
Direct	66.2	406	12.8
Indirect and Induced	37.9	465	23.9
Total	104.1	872	36.7

Source: NL-DFA, *Economic Impacts of the Newfoundland and Labrador Aquaculture Industry*, Annex 1, 2014.

The study also examined trends in the economic impacts of aquaculture in the province between 2003 and 2013. It showed that the industry experienced significant growth during this period. This was mainly due to a substantial increase in Atlantic salmon production as the industry continued to expand.

This provincial study also suggested that a large proportion of the economic repercussions of the industry occur in coastal and rural communities where aquaculture actually takes place. In many cases, these communities are in isolated areas where other economic opportunities tend to be limited. Moreover, it was stressed that these economic benefits extend across the province.

Similarly, a 2013 study by Gardner-Pinfold Consultants Inc. estimated the economic repercussions of the aquaculture industry for Canada as a whole. According to the study, the aquaculture industry generated over \$1 billion in GDP in 2010, with \$354 million in direct GDP and \$710 million in spin-off impacts (see Table 8.2). The industry created

5,828 direct FTEs, with an overall employment impact of over 14,000 FTEs. It generated direct labour income of \$193 million, with an overall income impact of \$618 million. According to the study, the aquaculture industry has helped revitalize remote, rural and coastal communities, including First Nations and other Aboriginal communities, and is, overall, an important sector of economic activity for Canada.

8.2 Opportunities and Challenges

Another study by Gardner-Pinfold Consultants Inc. examined the opportunities and challenges of aquaculture in Canada in 2010.⁸⁸ The study's findings are summarized in this section and updated, using more recent information gathered during the Committee's study.

With respect to salmon aquaculture, the study noted that consolidation of the sector has helped companies operating in B.C., N.B., N.L. and N.S.

Table 8.2 – Economic Impacts of Aquaculture in Canada, 2010

Production Value: \$927 Million	GDP (\$ Millions)	Employment (FTEs)	Labour Income (\$ Millions)
Direct	354.4	5,828	192.8
Indirect	463.7	5,638	285.7
Induced	245.9	2,614	139.5
Total	1,064.0	14,079	618.0

Source: Gardner-Pinfold Consultants Inc., *Socio Economic Impact of Aquaculture in Canada*, 2013 edition, prepared for DFO, February 2013, p. 4.

take advantage of economies of scale and strengthened their position on global markets. It was also indicated that salmon aquaculture producers in these provinces are well positioned with their proximity to the United States to supply a growing market. In addition, trade agreements with Europe and South Korea will open new market opportunities for them. Opportunities also exist to develop products with a higher market value through further processing of fish and their by-products.

The study also suggested that there are prospects for growth in salmon aquaculture in the four provinces by increasing the productivity of existing grow-out sites. In addition, there are some opportunities for growth with more access to new grow-out sites in B.C. and N.L. However, the development of additional near-shore aquaculture sites in N.B. is very limited. According to the study, growth in salmon aquaculture and other finfish production in this province would require a move towards more exposed or offshore sites. Offshore aquaculture would necessitate the development of systems and technologies capable of withstanding higher energy environments. Gardner-Pinfold Consultants Inc. indicated that other opportunities for growth in marine finfish aquaculture in N.B. are linked with the potential for species diversification (i.e., sturgeon, Arctic char, cod, and Atlantic halibut).

Similarly, access to new sites for salmon aquaculture in N.S. is limited because many locations can only be operated three seasons of the year; this is insufficient time to raise market-sized salmon. The study suggested, however, that these conditions could be adequate for production of Rainbow trout, although supply of eggs remains a major challenge to expansion of this sector. There are also opportunities to grow Atlantic halibut in marine net cages in N.S. In addition, N.S. could benefit, like N.B., from the development of offshore aquaculture. Finally, the study noted that

opportunities exist in all four provinces to develop mutually beneficial operating agreements with First Nations, on whose lands many high production aquaculture sites are located.

The study enumerated some factors that impede the ability of the salmon aquaculture sector to grow in all provinces, including a complex regulatory framework that creates operational impediments in aquaculture and discourages investment. In addition, risk of disease and sea lice may affect production levels, particularly in the context of a lack of access to a variety of veterinary drugs and pest control products. Moreover, it was stressed that low social acceptance due to environmental concerns regarding salmon aquaculture may constitute a major barrier to the expansion of the sector in some regions of the country.

With respect to shellfish aquaculture, Gardner-Pinfold Consultants Inc. noted access to vast marine lands and considerable market potential in B.C., N.B., N.L. and N.S. Increased production levels may also be achieved as a result of new trade agreements. In N.L., organic aquaculture certification may further enhance the sector's ability to compete in the marketplace. However, the sector remains fragmented. The small companies operating in this sector lack the financial resources to support technology innovation (particularly the mechanization of processes), resulting in low productivity, low profit margins and difficulty attracting investment. The study stressed that the shellfish sector also needs to address public issues about expansion based on environmental and aesthetic concerns.

The study noted that there is limited growth potential for the shellfish aquaculture sector in P.E.I. Current shellfish aquaculture activity is limited to bays and estuaries and is reaching full capacity with current operating techniques, available

technology, and the demands of multiple water users. Increased productivity could be achieved with new techniques and technologies. With respect to mussels, Malpeque Bay has been identified as the region having the greatest potential for further aquaculture development on the Island.⁸⁹ Further development in this area would have to take into consideration the views of other users of the marine resources. Other economic opportunities for the shellfish sector in the province include the potential for growing new species, such as scallops and quahogs.⁹⁰

Furthermore, the study indicated that the shellfish sector in Canada relies, to a great extent, on wild seed collection and it needs to invest in broodstock development to increase production efficiency. The sector faces some other important challenges as well, including sea duck predation and aquatic invasive species (AIS). AIS – such as the green crab, clubbed tunicate and vase tunicate – affect growth and meat yield and cause increased maintenance and labour costs for growers and processors.

The study mentioned human resource challenges as one major difficulty facing all segments of the aquaculture industry – in the finfish and shellfish sectors, as well as in grow-out sites and seafood processing plants. These challenges were also discussed on several occasions during the Committee's hearings and site visits both on the West Coast and the East Coast. Aquaculture facilities generally establish themselves in small and remote

communities and processing operations tend to locate themselves close to their product source. An aging population and the younger generation often moving away for their post-secondary education or for more lucrative jobs have led to labour shortages. This is despite the fact that the industry offers interesting employment opportunities and requires a diverse workforce – divers, veterinarians, marine biologists, IT technicians, business administrators, and more. Seasonal work associated with certain types of shellfish aquaculture and processing operations also makes it difficult to attract and retain workers. As a result, the industry has turned to temporary foreign workers to ensure that positions are filled. Labour shortages are seen as impeding the industry's growth.

Finally, the Committee learned that there is potential for diversification and innovation in the aquaculture industry in Canada, more particularly in B.C. and N.B., through the development of IMTA. In addition, seaweed monoculture already occurs in N.S., while QC is looking at the potential for developing the production of seaweed in the Gaspé region, including hatcheries on land, marine cultivation and primary processing. Moreover, there is practical and diverse experience in B.C., N.B., N.S., and P.E.I. with land-based closed-containment systems for species such as Atlantic salmon, Steelhead trout, Atlantic halibut, and Arctic char. However, access to working capital to allow operations to achieve an economy of scale required for profitability is needed.

89 VisionQuest, *Malpeque Bay Aquaculture - The Way Ahead*, prepared for DFO, November 2008.

90 Ibid.

CONCLUDING REMARKS

Marine aquaculture in Canada is a diverse industry that is well established in B.C., N.B., N.L., N.S. and P.E.I. Although the industry is present to a lesser extent in QC, it is – as elsewhere – an important economic driver in coastal regions where other opportunities tend to be limited. A range of biophysical conditions along the West and the East Coasts have allowed the aquaculture industry to grow a variety of finfish and shellfish species for commercial production. Today, the industry is characterized by a dominant finfish sector (particularly salmon), a strong shellfish sector (particularly mussels and oysters), and an emerging aquatic plant sector (particularly seaweed), mostly associated with the recent development of IMTA.

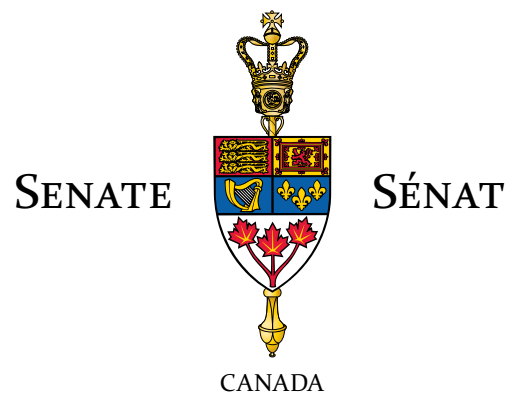
There are prospects for growth in marine aquaculture in Canada through the development of new grow-out sites both near-shore and offshore, increased productivity of existing operations, the diversification of the species cultivated, and the use of alternative production technologies. A growing aquaculture industry would further contribute to the economic development of coastal and rural communities and generate benefits that extend beyond these regions. There are also prospects for growth in land-based, closed-containment recirculation systems, notably for high-value species. However, total aquaculture production has declined in recent years, particularly in B.C. and N.B., while it has been relatively stable in N.S. and QC. Aquaculture production continues to grow in two provinces, N.L. and P.E.I., where there appear to

be close collaboration and cooperative decision-making between federal and provincial regulators along with social acceptance of the industry.

The complex regulatory framework governing aquaculture in Canada is often noted as an obstacle to further growth of the industry. Four of the provinces reviewed in this volume (N.B., N.L., N.S. and QC) have a predominantly provincially-controlled approach to aquaculture regulation, with each province having a statute dedicated to the regulation of aquaculture. The other two (B.C. and P.E.I.) have a predominantly federally-controlled approach to aquaculture regulation, with the federal *Fisheries Act* serving as the primary legislative framework. There are presently two initiatives in place to achieve more streamlined aquaculture governance: at the federal and provincial level, there is the work undertaken by the CCFAM; and in the Atlantic Provinces, collaborative work is undertaken as part of the MOU signed in 2008 towards a harmonized regulatory framework and policy environment for aquaculture.

The role DFO plays as the lead federal department for aquaculture management across Canada and its responsibilities pursuant to the *Fisheries Act* – more specifically ensuring that the industry is regulated sustainably across the country in a way that protects fish and fish habitat – are of paramount importance to the Committee's study and will be discussed in more detail in Volume Three of this report.





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