SENATE SÉNAT
CANADA

VOLUME TWO – AQUACULTURE INDUSTRY AND GOVERNANCE IN NORWAY AND SCOTLAND

Standing Senate Committee on Fisheries and Oceans

The Honourable Fabian Manning
Chair

The Honourable Elizabeth Hubley
Deputy Chair

June 2016

For more information please contact us:

by email: **pofo@sen.parl.gc.ca**
by phone: (613) 990-0088
toll-free: 1-800-267-7362
by mail: The Standing Senate Committee on
Fisheries and Oceans
Senate, Ottawa, Ontario, Canada, K1A 0A4

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MEMBERS

Senators who participated in this study:

The Honourable Fabian Manning, Chair

The Honourable Elizabeth Hubley, Deputy Chair

The Honourable Senators:

George Baker

Sandra M. Lovelace Nicholas

Thomas Johnson McInnis

Don Meredith

Jim Munson

Rose-May Poirier

Nancy Greene Raine

Carolyn Stewart Olsen

David M. Wells

The Committee would like to recognize the following Honourable Senators who are no longer serving members of the Committee whose contribution to the study was invaluable.

Lynn Beyak

Tobias C. Enverga Jr.

Ex-officio members of the Committee:

The Honourable Senators Claude Carignan, P.C., (or Yonah Martin) and James S. Cowan (or Joan Fraser).

Other Senators who have participated from time to time in this study:

The Honourable Senators: Batters, Demers, Fortin-Duplessis, Lang, McIntyre, Mercer, Plett, Tannas.

Parliamentary Information and Research Service, Library of Parliament:

Odette Madore, Analyst

Senate Committees Directorate:

Maxwell Hollins, Clerk of the Committee
Debbie Larocque, Administrative Assistant

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

B.C.:	British Columbia
CAR:	Controlled Activity Regulations (Scotland)
DFO:	Department of Fisheries and Oceans Canada
EIA:	Environmental Impact Assessment
FHL:	Norwegian Seafood Federation
FMA/S:	Farm Management Agreement / Farm Management Statement (Scotland)
IMR:	Institute of Marine Research (Norway)
IMTA:	Integrated Multi-Trophic Aquaculture
MGA:	Ministerial Group on Aquaculture (Scotland)
MGSA:	Ministerial Group for Sustainable Aquaculture (Scotland)
MOU:	Memorandum of Understanding
N.B.:	New Brunswick
N.L.:	Newfoundland and Labrador
NFSA:	Norwegian Food Safety Authority
NOFIMA:	Norwegian Institute of Food, Fisheries and Aquaculture Research
NOK:	Norwegian Krone
N.S.:	Nova Scotia
P.E.I.:	Prince Edward Island
SAIC:	Scottish Aquaculture Innovation Centre
SCNAI:	Strategy for a Competitive Norwegian Aquaculture Industry
SEPA:	Scottish Environment Protection Agency
SESNAI:	Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry
SSPO:	Scottish Salmon Producers Organisation
SMA:	Salmon Management Area (Canada)
SWOT:	Strengths, Weaknesses, Opportunities and Threats

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 held public hearings in Ottawa and undertook fact-finding missions 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). Public hearings were also held in some of these provinces. In addition, the Committee held videoconferences with government representatives from Norway and Scotland, two countries with aquaculture regulatory regimes comparable to Canada's. The Committee also completed a fact-finding mission in each country, to learn more about the operation and governance of the Norwegian and Scottish aquaculture industries.

This document constitutes Volume Two in a series of three volumes prepared by the Committee on this study. This volume presents a profile of the aquaculture industry in Norway and Scotland and highlights how aquaculture is regulated in these jurisdictions; the information contained herein is based on evidence heard as part of the videoconferences with the countries in question as well as on materials gathered during the Committee's fact-finding missions. Volume One provides a brief profile of the aquaculture industry and its governance in Canada, with a particular emphasis on the regulatory framework in place in each province. Volume Three includes the Committee's observations on the aquaculture industry and its governance structure in Canada, based on findings from the fact-finding missions and the evidence gathered during the public hearings.

This volume is divided into three chapters. Chapters 1 and 2 provide a portrait of the industry in Norway and Scotland respectively, and describe the legislative framework in place in each country to regulate aquaculture. Chapter 3 briefly compares the Norwegian, Scottish and Canadian aquaculture industries and their respective governance.

1 Senate of Canada, ***Journals of the Senate***, 2nd Session, 41st Parliament, 9 December 2013, p. 274.

CHAPTER 1: Norway

Profile of the Industry

1.1.1 Structure and Location[2]

The aquaculture industry in Norway is dominated by its finfish sector, with Atlantic salmon and Rainbow trout accounting for 93.9% and 5.8% respectively of total volume produced. Blue mussel, which accounts for 0.2% of overall aquaculture production, is the main shellfish species produced. The variety of species cultivated in Norway commercially is presented in Table 1.1. Seaweed aquaculture – either as a monoculture or a polyculture – is under development but generates very little biomass.[3]

The finfish sector of the Norwegian aquaculture industry was originally an owner-operated sector with hundreds of small firms. Over the years, the number of firms has declined as a result of increased horizontal integration. Regardless, the number of companies operating in the finfish sector in Norway remains much higher than in Canada. In 2013, the sector consisted of 158 companies – small, medium and large – sharing over 1,000 licences for grow-out sites in marine waters. The sector is, however, concentrated, with the 10 largest finfish aquaculture companies being responsible for 67.2% of total production. Some of these companies include Marine Harvest, Cermaq, Grieg Seafood, Norway Royal Salmon, Lerøy and Salmar. The finfish sector has also experienced vertical integration, with companies being involved in hatcheries, grow-out sites, fish processing and export operations. For its part, the shellfish sector currently involves 65 companies holding 225 licences.

Table 1.1 – Aquacultured Species in Norway

	Species
Finfish	• Atlantic Salmon • Rainbow Trout/Trout
Shellfish	• Blue Mussel

Source: According to information obtained from the Norwegian Directorate of Fisheries (Ministry of Fisheries and Coastal Affairs), "***Key Figures from the Norwegian Aquaculture Industry***," *Aquacultural Booklet*, 2013.

2 Unless specified otherwise, the information contained in this section is from the following document: Norwegian Directorate of Fisheries (Ministry of Fisheries and Coastal Affairs), "**Key Figures from the Norwegian Aquaculture Industry**," *Aquacultural Booklet*, 2013.

3 Norwegian Institute for Agricultural and Environmental Research, ***The Norwegian Seaweed Industry***, November 2012.

4 It should be noted that Norway is divided into 19 counties (known as "fylker") which themselves comprise 430 municipalities ("kommuner").

Aquaculture in Norway takes place in the counties along most of the country's coastline, located in more than 160 municipalities.[4] In the finfish sector, Nordland is the dominant producer county, with Hordaland coming second, Møre og Romsdal third, and Troms fourth (Figure 1.1 provides a map of Norway and its counties). The shellfish sector is active in eight counties, but production is more abundant in Sør-Trøndelag, Nordland, Nor-Trøndelag and Sogn og Fjordane.

1.1.2 Production

Figure 1.2 presents aquaculture production (volume and value) in Norway between 1999 and 2013. Production volume grew steadily during the 2000s and reached a peak at 1,321,119 tonnes in 2012. This was followed by a reduction of 5.6% in 2013. That year, aquaculture production totalled 1,246,544 tonnes; this included 1,244,180 tonnes

Lerøy Seafood Group is the world's second largest producer of Atlantic salmon and Norway's largest exporter of seafood. This publicly-listed company is fully integrated and operates aquaculture facilities in Norway through three separate legal entities: Lerøy Aurora AS (North Norway), Lerøy Midst AS (Central Norway), and Lerøy Vest AS (West Norway). The company also owns 50% of Scottish Sea Farms Ltd., the second largest salmon aquaculture company in Scotland. Senators went aboard the MS Lyna, a marine vessel, to visit one of Lerøy's grow-out sites located on Bjørnafjorden, about one hour from the company's headquarters in Bergen.

of finfish and 2,363 tonnes of shellfish, for a total value of 40 billion NOK (or C$7 billion).[5] In comparison, Canada produced 130,337 tonnes of finfish and 41,760 tonnes of shellfish in 2013, valued at $963 million.[6] Currently, Norway is the largest Atlantic salmon producer in the world, accounting for about half of global production, followed by Chile, Scotland and Canada. A report estimates that the production value of the salmon and trout sector in Norway could grow sixfold by 2050 in response to the increasing global demand for seafood.[7]

1.1.3 Economic Repercussions

There has been very rapid development of Norway's aquaculture industry, and the production of Atlantic salmon has grown to become a major sector of its economy. The industry is now an economic pillar for several Norwegian coastal communities. Aquaculture alone contributes to the employment of about 8,500 people. It is estimated that when spin-off effects are taken into account (i.e. both direct and indirect impacts), the industry generates approximately 20,000 jobs in small coastal communities and contributes an additional 27 billion NOK in Gross National Product (or C$4.7 billion).[8] The Norwegian aquaculture industry is, to a significant extent, export-oriented, and 94% of overall production is exported. Currently, aquaculture represents almost 60% of all Norwegian seafood exports.

Figure 1.1 – Map of Norway and its Counties

Source: Norwegian Ministry of Local Government and Regional Development, *Local Government in Norway,* 2008, p. 3.

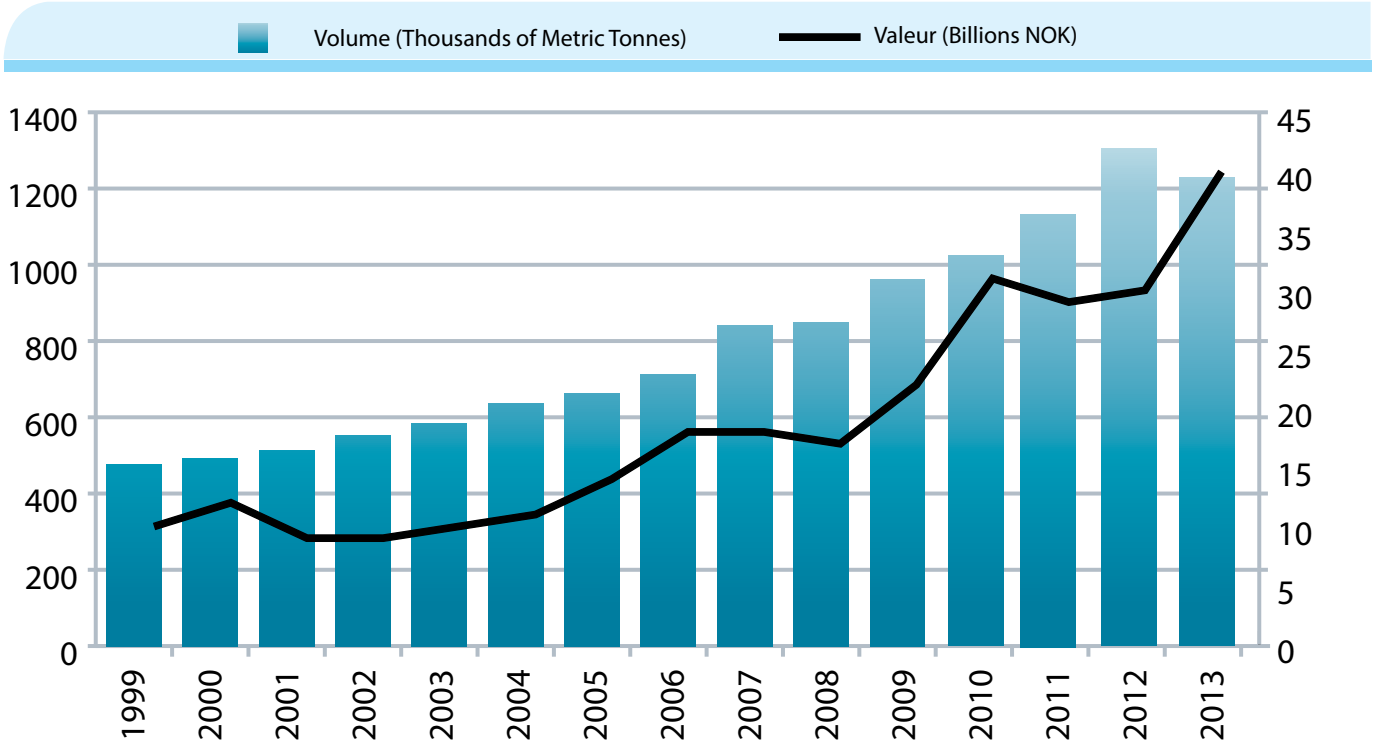
5 Norwegian Directorate of Fisheries, ***Aquaculture Statistics***, 2013 [accessed 19 March 2015].
6 Fisheries and Oceans Canada (DFO), "**Production Quantities and Values,**" *Aquaculture* [accessed 19 March 2015].
7 ***Value Created from Productive Oceans in 2050***, a Report Prepared by a Working Group Appointed by the Royal Norwegian Society of Sciences and Letters and the Norwegian Academy of Technological Sciences, 2013.
8 Norwegian Seafood Federation, ***2012 Environmental Report – Norwegian Seafood Industry***, 2013, p. 12.

1.2 Regulatory and Policy Framework[9]

1.2.1 Regulatory Framework

The aquaculture industry in Norway is subject to a large number of laws and regulations adopted at the national, county and municipal levels. At the national level, the *Aquaculture Act* of 2005, the *Food Safety Act* of 2003 and the *Animal Welfare Act* of 2009 are the three most important pieces of legislation, and several regulations governing aquaculture emanate from these three acts.

Figure 1.2 – Aquaculture Production[a] in Norway, Volume and Value, 1999 to 2013



Note: a. Aquaculture production includes the amount produced on sites and excludes hatcheries or processing. Data for 2013 are preliminary.

Source: Based on data from the Norwegian Directorate of Fisheries, ***Aquaculture Statistics***, various years [accessed 19 March 2015].

9 Unless indicated otherwise, the information presented in this section is based on the following two documents: Norwegian Directorate of Fisheries (Ministry of Fisheries and Coastal Affairs), ***Aquaculture, Introductions and Transfers and Transgenics – Focus Area Report: Norway***, n.d., and Food and Agriculture Organization of the United Nations, ***National Aquaculture Legislation Overview – Norway***, n.d.

The Department for Fisheries and Aquaculture, which is an executive body within the Ministry of Trade, Industry and Fisheries, is responsible for the administration and enforcement of the *Aquaculture Act* and its regulations[10]. The Act is an enabling piece of legislation which aims to "promote the profitability and competitiveness of the aquaculture industry within the framework of sustainable development and contribute to the creation of value on the coast." The main sections of the Act include[11]:

- Aquaculture licensing system: Licences are required to engage in aquaculture in Norway. Regulations under the Act govern the allocation of licences, the species to be produced, the geographic areas or sites where production is to take place and the maximum biomass permitted at a given location (usually 780 tonnes per licence, except in Troms and Finnmark where the maximum is set at 900 tonnes). Aquaculture licences are granted in allocation rounds determined by the Ministry[12]. Applicants with the highest bids are granted the licences. There are years during which no licences are granted. An aquaculture licence is approved in perpetuity, but may be withdrawn in case of breach of conditions set out in the licence, in the *Aquaculture Act* or in environmental legislation.
- Coordination among licensing authorities: Time limits are established for each step of the aquaculture licence application process and applicants deal with only one public agency, which coordinates the work of the other public authorities (national and local) involved in the processing of aquaculture applications. The county is the coordinating authority or "one-stop-shop," while the other authorities are: the Department for Fisheries and Aquaculture, the Norwegian Food Safety Authority, the Norwegian Costal Administration, the County Governor and, in some cases, the Norwegian Water Resources and Energy Directorate (see Figure 1.3). The application is also forwarded to the relevant municipality, which acts as the planning and construction authority. Public consultations take place at the municipal level. The Act prescribes that the different public authorities "are obligated to undertake an efficient and coordinated processing of applications." Case handling must not take longer than 22 weeks in total. All of the relevant authorities must issue their approval for a licence to ultimately be granted.

Under the *Aquaculture Act*, aquaculture is considered to be the production of aquatic organisms, where production relates to interventions that influence the weight, size, number and characteristics of aquatic organisms. Aquatic organisms refer to animals and plants that live in, on or near water. The Act applies to all facets of aquaculture in marine and inland waters, land-based aquaculture, and to sea ranching.

10 Norwegian Ministry of Fisheries and Coastal Affairs, ***The Aquaculture Act***, 2005..

11 It should be noted that, pursuant to aquaculture legislation, salmon, trout and rainbow trout are under special regulation that is not applicable to other species. In addition, licences for the production of blue mussels, cod and halibut, as well as for sea ranching, are free and can (in principle) be applied for at all times. These rules are laid out in separate sets of regulations.

12 A biological risk assessment of proposed aquaculture activities is performed as part of the aquaculture licence application process (seabed conditions, potential risk of pollution, distance from other grow-out sites, whether the site is sufficiently sheltered from ocean waves and other forces, etc.).

- Environmental sustainability: Any aquaculture operation must be established, run and decommissioned in an environmentally responsible manner. The operator must conduct the necessary environmental surveys and document the environmental condition of the site at the time of the establishment, operation and decommissioning of the aquaculture facilities[13]. Regulations require the use of certified aquaculture equipment or installations. Other regulations govern the release of "foreign organisms" or contain provisions in relation to escapes. The Act provides that the Minister may establish a ban, order the relocation of or place other conditions on aquaculture activities in order to protect areas of special value.
- Land/coastal utilization: Aquaculture licences can only be granted within the aquaculture zones that have been identified by the municipalities as part of their land use plan or coastal zone plan.
- Transfer and mortgaging of licences: The Act allows for a licence to be transferred on the open market from one holder to another without any review or approval by public authorities. The conditions stipulated in the licence continue to apply to the new holder. However, there is a ceiling that applies to the ownership of licences: a licence holder cannot control more than 25% of the total licence biomass in the country. An aquaculture licence can be mortgaged and, as such, can be used as collateral. An aquaculture register records all individual licences, including detailed information on the type of licence, species, capacity, location, and more.
- Enforcement and sanctions: Sanctions may include the execution of measures and the reimbursement of expenses, as well as the imposition of violation fines and imprisonment in case of criminal liability.

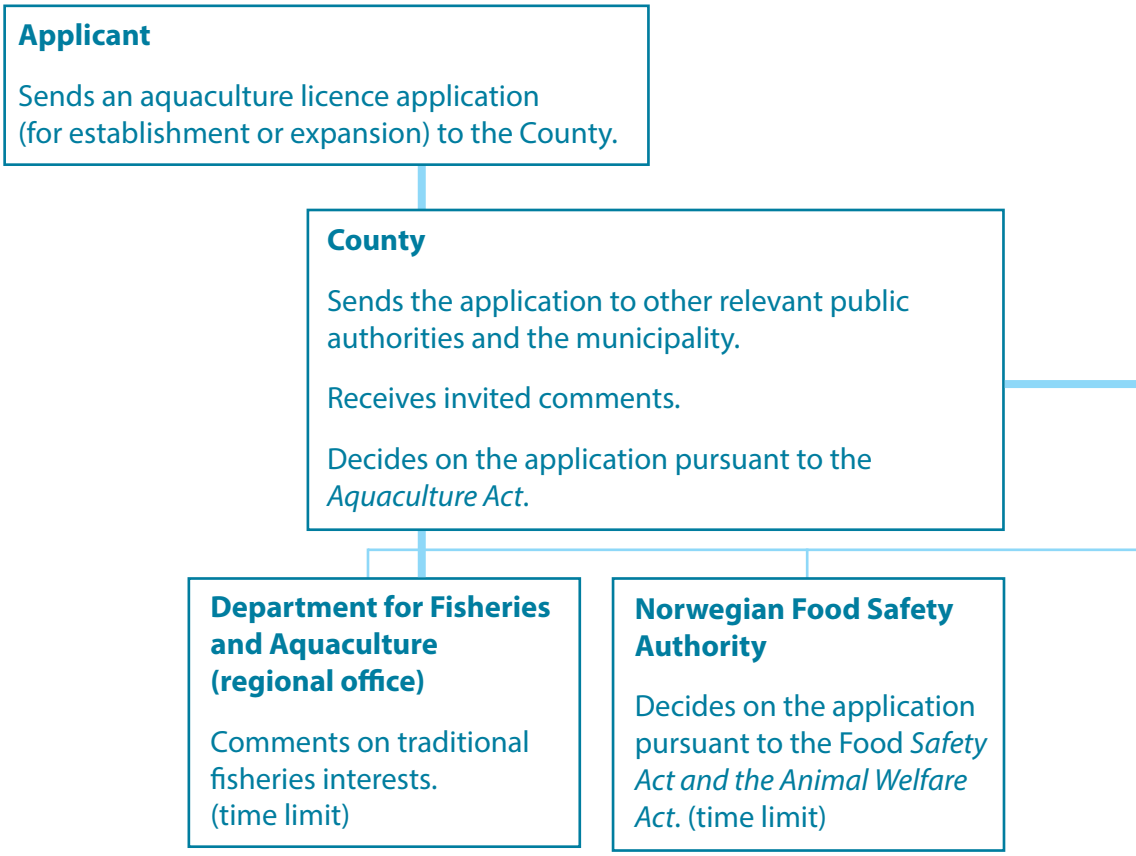
The Norwegian Food Safety Authority (NFSA) is responsible for the administration and enforcement of the *Food Safety Act*[14] and the *Animal Welfare Act*[15]. The *Food Safety Act* regulates animal health and food safety issues related to the operation of aquaculture facilities, such as the use of feed and chemotherapeutants, as well as food safety measurement. The purpose of the *Animal Welfare Act* is to promote animal welfare and respect. Together, the two pieces of legislation apply to all aspects of the aquaculture value chain, from production to processing through distribution. It is necessary to obtain an authorization from the NFSA to establish an aquaculture facility or expand an existing one. Before granting an authorization, a risk assessment of disease spread in the aquaculture facility and the surrounding environment has to be conducted. When conducting the assessment, the following aspects are of relevance: distance to other grow-out sites and rivers; species to be raised and production volume; general disease situation surrounding the location selected; risk factors that may compromise the welfare of the fish; and more. The NFSA is

13 Regular environmental surveys are undertaken as part of the operation of an aquaculture site and results are reported to the Department for Fisheries and Aquaculture. If results show unacceptable conditions, new surveys are carried out. If results still show unacceptable conditions, the Department can order that the site be left fallow until a new survey shows that the environmental conditions are acceptable. Regulations require that grow-out sites be left fallowed for at least two months between production cycles.

14 ***Food Safety Act***.

15 ***Animal Welfare Act***.

Figure 1.3 – Aquaculture Licence Application Process in Norway



Source: Adapted from Inger Elisabeth Meyer, First Secretary, Royal Norwegian Embassy, *Norwegian Aquaculture*, Brief presented to the Committee, 5 June 2014, p. 7.

Municipality

Registers and announces the application to the public in the local newspaper; holds public hearings as required by law.

Clarifies land and coastal zone plans according to the *Planning and Construction Act*.(time limit)

Norwegian Coastal Administration

Decides on the application pursuant to the *Harbour Act*. (time limit)

County Governor

Decides on the application pursuant to the *Pollution Control Act*.(time limit)

Comments on nature conservation as well as on recreational, fishing and game interests.(time limit)

Norwegian Water Resources and Energy Directorate

Only involved in cases that concern extraction of water (e.g.: hatcheries), pursuant to the *Water Resources Act*.

Decides on application and issues statements.

responsible for ensuring that aquaculture facilities are operated in compliance with the fish health and welfare-related legislation. The authority is empowered to take any decisions and measures deemed necessary to ensure implementation of the provisions contained in the legislation. For example, the NFSA may order that fish be destroyed to fight disease in an aquaculture site and to prevent infection from spreading to other sites.

Like the NFSA, the Department for Fisheries and Aquaculture monitors compliance of aquaculture facilities in accordance with the *Aquaculture Act* and its regulations. In order to carry out monitoring in a more efficient manner, the Department has introduced "AkvaRisk," a risk-based program in which companies and sites are selected based on assessment of risk of non-compliance. All marine aquaculture sites are categorized into three groups – low, medium and high risk. Monitoring focuses on the high risk group. Other monitoring is undertaken in cases of violation of the provisions. All aquaculture operations in the National Salmon Fjords are controlled every year (discussed further below).

There are also regulations in place that govern the control and registration of chemotherapeutants, establish withdrawal periods to ensure that the fish cannot be harvested until after a specified time after stopping the medication, and provide for the analysis of pharmaceutical residues in cultured fish. All pharmaceuticals that are distributed for use in aquaculture must have a prescription from a veterinarian or an authorized fish health biologist, and are registered by the NFSA. The Norwegian Institute of Public Health publishes data on the use of pharmaceuticals by the aquaculture industry on an annual basis.[16]

1.2.2 Policy Framework

Norway set out its strategic framework for aquaculture in two documents: the 2008 *Strategy for a Competitive Norwegian Aquaculture Industry* (SCNAI)[17] and the 2009 *Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry* (SESNAI).[18] Both documents outline a number of measures and goals for Norway's regulation of and prospect for aquaculture. The SCNAI focuses on four areas to ensure that Norwegian aquaculture maintains its position as a leading international producer and exporter: global market challenges; environmental sustainability; a better coordinated and more efficient licensing application process; and, research and development. Similarly, the SESNAI focuses on five areas where the negative environmental impacts of aquaculture should be mitigated. The five areas are: genetic interaction and escapees; pollution and effluents; diseases, including sea lice; the use of coastal areas; and feed and feed resources.

The SCNAI and the SESNAI may be revisited in the coming months. In fact, the Norwegian Government recently tabled in the Storting (the Norwegian Parliament) a white paper that sets out goals for the future development of the seafood industry, including aquaculture. The government is "committed to make Norway the world's foremost seafood nation" and "aquaculture will have to play a key role in achieving this" as long as it can be environmentally sustainable.[19]

16 Norwegian Institute of Public Health, ***Increased Use of Medicines in Norwegian Fish Farming***, 3 April 2014.
17 Norwegian Ministry of Fisheries and Coastal Affairs, ***Strategy for a Competitive Norwegian Aquaculture Industry***, 2008.
18 Norwegian Ministry of Fisheries and Coastal Affairs, ***Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry***, 2009.
19 Lisbeth Berg-Hansen, Norwegian Minister of Fisheries and Coastal Affairs, "**Norwegian Aquaculture – Management Policies and Regulations**," Speech, 26 June 2013.

In 2009, Norway and Scotland signed a Memorandum of Understanding (MOU) on cooperation and best practices in aquaculture.[20] The MOU covers environmental sustainability (in particular fish health and equipment standards for grow-out sites), regulation, access to financing and insurance, and collaboration on research. In 2013, the two countries agreed to enhance their collaboration and information sharing within the context of their MOU by holding regular bilateral meetings between fisheries ministers and other officials. In 2014, Norwegian officials attended – for the first time – a meeting of the Ministerial Group for Sustainable Aquaculture in Scotland.[21]

The Norwegian Ministry of Trade, Industry and Fisheries in Oslo – which acts as the secretariat for both the Minister of Trade and Industry and the Minister of Fisheries – is responsible for the country's trade, industry and seafood policy. Within the ministry, the Department for Fisheries and Aquaculture is responsible for aquaculture policy and management, the licensing system, environmental sustainability, and more. Senators were given an overview of aquaculture policy and legislation in Norway, including information about the government's view on industry growth and recent initiatives such as the "green concessions". The importance of collaboration amongst industry, government and academia in aquaculture research was highlighted.

20 ***Memorandum of Understanding on Aquaculture Cooperation between the Scottish Government and the Norwegian Ministry of Fisheries and Coastal Affairs***, 17 August 2009.

21 The Scottish Government, "**Aquaculture Ties with Norway Strengthened**," *News Release,* 8 September 2013.

The Norwegian Food Safety Authority (NFSA) regulates the aquaculture industry through its administration and enforcement of the *Food Safety Act* and *the Animal Welfare Act*. Senators met with NFSA representatives and discussed issues related to fish health and fish welfare, including sea lice and the use of pest control products, as well as monitoring and enforcement activities.

Norway and Canada also signed a MOU in 2008 that is more comprehensive and encompasses bilateral cooperation on fisheries, aquaculture and international governance.[22]

1.2.3 Research

The Committee heard that aquaculture is a priority research area in Norway and that the country is an international leader in the field. There is a high level of collaboration between government, research institutions and the industry, making Norwegian aquaculture innovative and cutting-edge.[23] Some of Norway's research institutes in this field include: the Norwegian Institute of Food, Fisheries and Aquaculture Research (NOFIMA), SINTEF Fisheries and Aquaculture, the Institute of Marine Research (IMR), and the National Veterinary Institute.

When the 2009 SESNAI was implemented, the Norwegian Government requested that the IMR propose scientifically-based sustainability indicators and related thresholds to estimate the severity of the potential environmental impacts

22 ***Memorandum of Understanding on Fisheries Cooperation between the Department of Fisheries and Oceans of Canada and the Ministry of Fisheries and Coastal Affairs of Norway on Bilateral Co-Operation on Fisheries, Aquaculture and International Governance Issues***, 22 May 2008.

23 Inger Elisabeth Meyer, First Secretary, Royal Norwegian Embassy, *Minutes of Proceedings and Evidence of the Standing Senate Committee on Fisheries and Oceans,* 5 June 2014 (**11:6**).

of aquaculture. Every year since 2010, the IMR has conducted a risk assessment of the environmental effects of salmon aquaculture. While in Norway, the Committee had the opportunity to tour the IMR and was apprised of its most recent risk assessment results[24]:

- Genetic integrity: 21 out of 37 wild salmon populations investigated face a moderate-to-high risk of genetic interbreeding from escaped salmon;
- Sea lice impact: About 27 of 109 grow-out sites investigated for sea lice infestations indicated a moderate-to-high risk of wild salmon smolt mortality, and 67 sites indicated moderate-to-high risk of mortality from sea lice for wild sea trout;
- Disease transfer: Despite viral disease outbreaks in many grow-out sites, screening of wild salmonids showed a low to very low presence of the same viruses;
- Organic load and nutrients: Only 2% of all grow-out sites displayed unacceptable levels of organic loading onto sea beds; therefore, the risk of eutrophication and organic load beyond the grow-out site is considered low.

IMR representatives noted that there are limitations to the approaches used to estimate these

The Norwegian Seafood Federation (FHL) represents the aquaculture industry, the commercial fisheries sector, and the seafood processing/distribution sector. Senators met with some FHL members and were given a general perspective on how aquaculture operates and is governed in Norway. There were also discussions on how the industry is handling sea lice and escape events, two important challenges facing aquaculture in the country.

Photo courtesy of: Norwegian Seafood Federation.

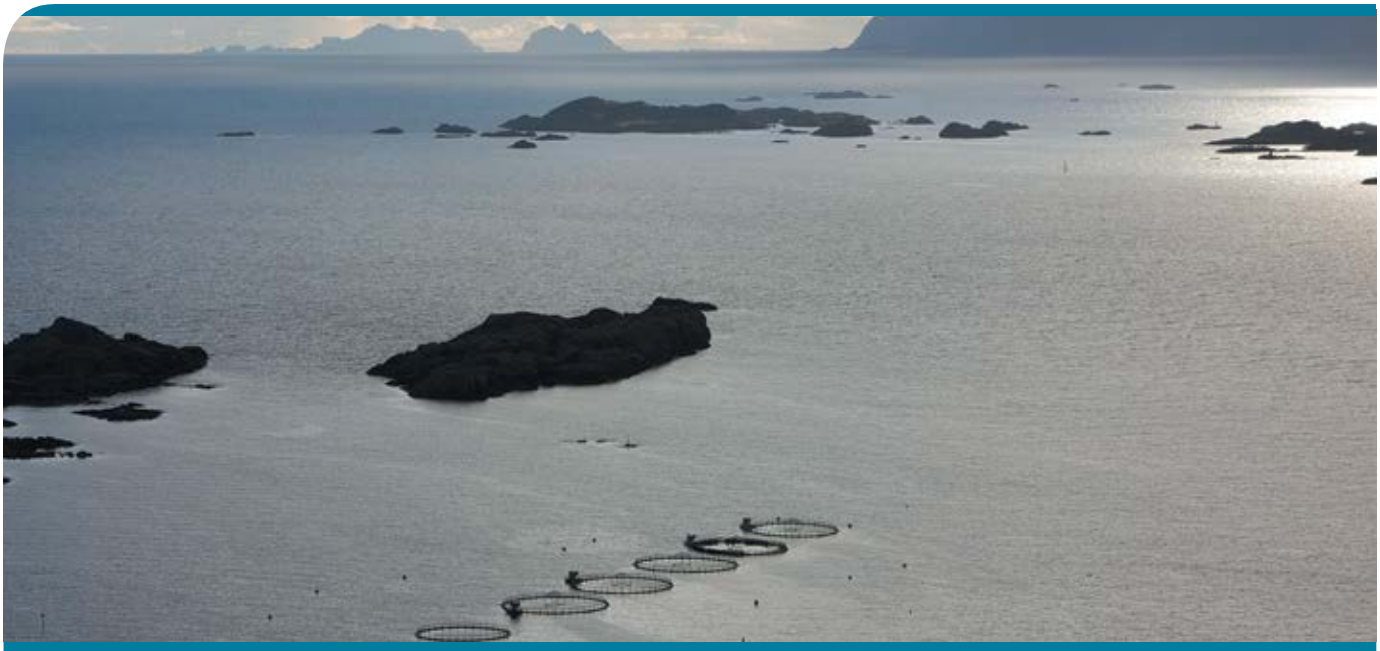
24 Geir Lasse Taranger et al., "**Risk Assessment of the Environmental Impact of Norwegian Atlantic Salmon Farming**", *ICES Journal of Marine Science,* 2 September 2014.

risks, and pointed to the need for improved monitoring, enhanced risk assessment methods and better environmental risk indicators. Nonetheless, the risk assessment suggests that sea lice and escapes are the main challenges the industry is facing.

1.3 Current Challenges

During the fact-finding mission, the Committee was told that a number of factors contributed to the continual growth of the aquaculture industry in Norway, including: good natural conditions, continuous technological development by the industry, strong government support for aquaculture, good infrastructure at close proximity (harbours, boats, roads, etc.), strong research and development, marketing through the Norwegian Seafood Council (the single organization that promotes aquaculture and commercial fishery products on the domestic and international markets), and cooperation and exchange of information between government, researchers and the industry.

The Committee also learned about the prospects and challenges of the Norwegian aquaculture industry. The main prospect mentioned on several occasions was the potential for growth of the industry along with its environmentally sustainability. In other words, environmental sustainability is a prerequisite for the long term development and growth of the industry. The main challenges mentioned were, as noted above, sea lice infestations and escapes. On a few occasions, two tools were mentioned to meet these challenges: the use of offshore sites and new technological solutions.



The IMR is the largest centre of marine science in Norway. It carries out research and monitoring activities related to marine ecosystems and the aquaculture, oil and gas and mining industries. The IMR runs its own Aquaculture Programme and performs scientific experiments in its own laboratories, as well as empirical work at grow-out sites. Research includes, but is not limited to: the environmental impacts of aquaculture systems, health of aquacultured organisms and spread of disease, and the dispersal and recapture of escaped fish. The results of its research are available to the public. Senators were given a tour of the IMR facilities and met with some of its researchers.

1.3.1 Sea Lice

In Norway, each grow-out site must count sea lice on a sampling of fish at least twice per month in accordance with specific instructions; the findings must be reported to the NFSA. If the sea lice count at a particular site exceeds a maximum allowable limit, the operator is obliged to perform a delousing treatment within 14 days. Over the last decade, the aquaculture industry has mostly relied on two methods of treatment – emamectin benzoate (SLICE®, which is delivered orally) and pyrethroids (pest control products delivered in a bath treatment) – for treating fish against sea lice. However, sea lice along the Norwegian coastline have developed a resistance against these products. New national regulations came into effect in 2009 to address this problem. Measures included:

- Mandatory reporting of all suspected or confirmed cases of reduced sensitivity or resistance of sea lice to any of the available treatments;
- Powers provided to the NFSA to demand a prompt reduction in biomass at any given grow-out site and, if necessary, slaughtering of all the fish in a given site where operators are found unable to maintain the sea lice levels under the maximum allowable levels (that year, the maximum was set at 0.5 adult female lice per fish); and
- Powers provided to the NFSA to propose and implement zone regulation in limited geographical areas that could include mandatory extension periods for fallowing, a ban against new smolt entries into the area and a ban against the use of a specific sea lice compound where resistance had been documented.

Also in 2009, the Norwegian Seafood Federation (FHL), the organization that represents the aquaculture industry (as well as the commercial fisheries sector), published a set of guidelines for sea lice treatment. In 2011, the use of closed tarpaulins during sea lice management was made mandatory to mitigate the risk of resistance-development. In addition, Norway has implemented an integrated pest management strategy for sea lice whereby all grow-out sites in selected areas are required by law to participate in a synchronized delousing treatment program. The program is mandatory along the Norwegian west coast. The primary objective is to minimize the sea lice infestation levels on Atlantic salmon during the wild smolt migratory window in the spring and early summer.

In recent years, there has been an increased interest in the use of wrasse (a cleaner-fish) as a biological delousing agent. Wrasses have initially been captured in the wild and introduced into the cages together with the fish. However, it is recognized that the wild stocks of these fish cannot supply the amount the aquaculture industry needs for sea lice management. Recent developments in experimental culture of wrasse show promising results. Lumpsucker, another species of cleaner-fish, is also used with success in salmon aquaculture for the same purpose. Another option being considered to minimize the spreading of sea lice between cages is the establishment of a minimum distance between different grow-out sites.

In June 2014, the Ministry of Trade, Industry and Fisheries announced stricter rules on sea lice.[25] In accordance with these rules, aquaculture operators would be permitted to increase their maximum biomass permitted by 5% but, in turn, they would

25 Norwegian Ministry of Trade, Industry and Fisheries, "**Environmental Compliance Demanded of New Aquaculture Growth**", *News Release,* 23 June 2014.

have to ensure that there are no more than 0.1 adult female lice per aquacultured fish on average on their sites. This limit, which is more stringent than the current limit of 0.5 lice per fish, would be required to be achieved by using a maximum of two medication treatments per production cycle. This policy is intended to help reduce the development of resistance against the delousing compounds used today. It is also expected that this would encourage the use of non-medicinal methods. Stricter requirements regarding sea lice would be followed up through increased control, especially from the NFSA. An additional 10 million NOK would be invested by government to strengthen monitoring. Any violation of these conditions would be met with predictable reactions and sanctions. The aim was for the new rules to come into force by the end of December 2014.

During the fact-finding mission in Norway, the Committee learned that the aquaculture industry has also experimented with the use of the "snorkel cage" to reduce sea lice. It was explained that sea lice primarily live at shallow depths and, accordingly, it could be possible to prevent the propagation of the parasite by placing fish in deeper waters, below the "louse zone." This new sea cage technology establishes a lice-free zone where the salmon can still thrive. A net roof is placed to hold salmon deeper than the parasite-risky surface layer. A central cylindrical passage, the snorkel, which is impermeable to parasites, allows salmon to swim to a shallower portion of the water column, where oxygen is more abundant. Senators were told the experiment showed that the use of the snorkel cage reduces sea lice infestations compared to traditional cages and that it is chemical-free.

While in Norway, the Committee had the opportunity to meet with some industry representatives who noted that salmon sea lice regulations were enforced 10 times between 2008 and 2014. These regulations were applied either nationally, to some regions only or during selected months. In their view, regulations succeeded in reducing the prevalence of sea lice on salmon, helped minimize the negative effects of lice on both wild fish and aquacultured fish, and also assisted in reducing and combating resistance to treatment. They stated, however, that there was still room for improvement and that sea lice regulations should be set by zone. In addition, they suggested that the impact of these local regulations should be subject to assessment for compliance, enforcement and goal achievement. Furthermore, it was indicated that efforts should be devoted to the eradication of sea lice on salmon, rather than mitigation efforts to reduce the presence of sea lice.

According to the Norwegian Veterinary Institute, sea lice – more particularly extensive delousing treatment and increased resistance to treatment – remains one of the most significant challenges for the aquaculture industry in Norway.[26]

1.3.2 Escapes

In Norway, the escape of fish from aquaculture establishments is considered "the most serious negative environmental consequence of aquaculture," particularly in regard to the risk of

26 The Norwegian Veterinary Institute is a government agency funded by the Ministry of Agriculture and Food, the Ministry of Trade, Industry and Fisheries and the Norwegian Research Council. The Institute routinely collects data on the health of aquacultured and wild fish and publishes fish health **reports** on an annual basis. The reports describe disease trends over the years, highlight disease outbreaks by region, provide data on number of cases by disease, discuss challenges and examine possible solutions. The latest report available describes the health situation in aquacultured fish for the year **2013**.

interbreeding with wild Atlantic salmon.[27] Norwegian authorities acknowledge that: "Scientific comparisons of wild and farmed salmon, and their cross-breeds, have shown that gene transfer from farmed to wild fish can reduce the latter's ability to survive. This is why such gene transfer is one of the main challenges with escapes. Records of escaped farm salmon in a number of Norwegian watercourses since the late 1980s document a very high proportion of escapees in many watercourses. Genetic mutation is already demonstrable in some salmon stocks."[28] Accordingly, the Department for Fisheries and Aquaculture, in collaboration with the industry, environmental non-governmental organizations and other government agencies, launched *Vision No Escapees* in 2006, an action plan on containment. Measures adopted as part of the action plan include[29]:

- NS 9415 is a standard that places strict technical specifications on the dimension, design, installation and operation of floating aquaculture installations. The standard helps ensure that aquaculture installations can cope with forces from waves, winds and currents. To ensure that the standard is adhered to by the industry, regulations were laid out stipulating that operators can only use installations, components and equipment certified in accordance with NS 9415. Since the standard was introduced in 2009, equipment damage/failure has become less frequent.
- Development of a code of containment by the industry, with regular audits and inspections of aquaculture establishments by the Department. In addition, inspectors investigate all significant escape episodes. A levy paid by the aquaculture industry helps to defray the cost of audits and inspections.
- Creation of the Escape Commission for Aquaculture, a permanent body which investigates every escape incident, analyzes the causes of escapes and proposes regulatory improvements.
- The requirement to immediately report any suspicion of escapes to the Department. Aquaculture operators are also required to take steps to capture escaped fish. Failure to report suspected escapes is a criminal offence. The Department publishes reports of escape events and escape statistics on its website.
- Severe fines for violation of environmental regulations.

In the same vein, the Storting designated 52 National Salmon Rivers and 29 National Salmon Fjords in 2007. Within these areas, the salmon aquaculture industry is subject to stricter legislation. For example, it is prohibited to establish new salmon aquaculture facilities for the production of fish and broodstock within the National Salmon Fjords and Rivers. In addition, it is not possible to increase capacity at already established locations within these areas; and, all aquaculture operations in

27 Norwegian Ministry of Fisheries and Coastal Affairs, ***Strategy for a Competitive Norwegian Aquaculture Industry***, 2008, p. 14.

28 Norwegian Ministry of Fisheries and Coastal Affairs, ***Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry***, 2009, p. 5.

29 The action plan was updated the following year. See: Norwegian Directorate of Fisheries, ***New Vision No Escapees***, December 2007.

these areas are controlled every year. Moreover, aquaculture grow-out sites must be located at least 5 km from the National Salmon Rivers. Finally, since 2011, there has been a ban against commercial salmonid aquaculture production in the 14 National Salmon Fjords of highest importance and aquaculture facilities already established were required to move out of these zones.

In 2013 and 2014, the Norwegian Government issued 45 new aquaculture licences for salmon and trout called "green concessions." These types of licences were allocated to producers who committed to use technologies or operational methods that reduce the environmental impacts from escapees and sea lice on wild salmonid stocks. The green concessions were designed to accelerate the commercialization of more environmentally friendly methods of production.

Furthermore, the Department of Fisheries and Aquaculture is also contemplating the introduction of changes to its *Aquaculture Act*, including:

- The mandatory tagging of aquaculture animals, to better distinguish between wild and escaped aquacultured salmon, and to better find the responsible operator after an escape incident;
- The use of sterile fish to reduce the negative consequences associated with salmon aquaculture escape incidents;
- The creation of a fund, financed by the salmon aquaculture industry, to cover the cost of removing escaped fish from a representative number of rivers;
- Revisions to the penal provisions of the law, providing that only companies can be given administrative fines and establishing a regime of control liability (individuals may still be prosecuted in cases of gross negligence).[30]

Finally, the Ministry of Trade, Industry and Fisheries now allows the production of smolt of up to 1 kg in weight. The decision was based on the desire to reduce the time spent in marine grow-out cages, thereby reducing the risk of escape events and exposure to sea lice and other disease agents. Several facilities for production of larger smolt are now being planed and tested. There are two main types of facilities: land-based recirculation systems and semi-closed floating containments. Production until smoltification continues to be performed as normal. Post-smolt will then be transferred to either type of facility until the fish reach 1 kg. There are only very few and small-scale facilities currently in operation.[31]

30 Norwegian Ministry of Fisheries and Coastal Affairs, ***The Norwegian Aquaculture Act***, 1 January 2014. It should be noted that the Ministry recognizes that: "The use of both sterile fish and mandatory tagging raise questions concerning animal welfare, and an actual introduction of these requirements is not likely for a couple of years."

31 Norwegian Veterinary Institute, ***The Health Situation in Norwegian Aquaculture 2013***, 2014, p. 8.

CHAPTER 2: Scotland

2.1 Profile of the Industry

2.1.1 Structure and Location

The aquaculture industry in Scotland comprises three sectors: finfish, shellfish and aquatic plants. The vast majority of aquaculture production (95%) is concentrated on finfish, while shellfish accounts for the remaining 5%. The aquatic plant sector (seaweed) is still at the developmental stage. The variety of species aquacultured in Scotland is presented in Table 2.1.

Like Canada, the finfish sector in Scotland has seen a structural change over the years with consolidation achieved through a number of mergers and takeovers. This has reduced the number of companies operating within the sector and these now tend to be more substantial in scale with connections to international corporate bodies. The finfish sector is dominated by the production of Atlantic salmon, with four companies operating 85% of the marine sites:[32] Meridian Salmon Farms (Marine Harvest),[33] Scottish Sea Farms (equally

Table 2.1 – Aquacultured Species in Scotland

	Species
Finfish	• Atlantic Salmon • Rainbow Trout • Brown/Sea Trout • Atlantic Halibut • Wrasse • Cod • Arctic Char
Shellfish	• Blue Mussel • Oyster (Pacific, Native) • Scallop (King and Queen)
Aquatic Plants	• Seaweed

Source: According to information obtained from ***Scotland's Aquaculture*** [accessed 19 March 2015].

32 Based on information obtained from the website of **Scotland's Aquaculture** [accessed 19 March 2015].

33 It should be noted that in May 2014 the Canadian-based company Cooke Aquaculture purchased Meridian Salmon Farms Limited from Marine Harvest, including assets in Shetland, Orkney and the mainland of Scotland. See Cooke Aquaculture, "**Canadian Company Closes Deal in Northern Scotland – Meridian Salmon to become Cooke Aquaculture Scotland**," *News release*, 14 May 2014.

owned by Salmar and Lerøy, two Norwegian companies), The Scottish Salmon Company and Hjaltland Seafarms Ltd (Grieg Seafood). These large companies are vertically integrated and operate hatcheries, grow-out sites and processing plants in various locations. Smaller companies include Loch Duart Ltd, Wester Ross Fisheries Ltd and Balta Island Seafare Ltd, among others. Finfish aquaculture sites are located on the west and north coasts of the Scottish Mainland and in the Western Isles, Orkney and Shetland.[34] There are currently no marine finfish aquaculture sites on the north and east coasts of Scotland. The Scottish Government introduced a presumption against further marine finfish aquaculture in these areas in 1999 to safeguard migratory fish species. This extensive zone covers a large proportion of the coastline of Scotland and its most highly productive salmon river catchments. Based on a precautionary approach, this presumption continues to apply until possible effects of aquaculture development on wild salmonid populations can be more fully assessed.[35] All marine finfish aquaculture takes place in net cages. There is no land-based closed-containment for commercial aquaculture in Scotland as it is not considered to be economically viable at this time.[36]

Marine Harvest (Scotland) is owned by Marine Harvest ASA, a Norwegian-based company that is one of the largest seafood companies in the world, and the world's largest producer of Atlantic salmon. In Scotland, the company operates hatcheries, grow-out sites, as well as primary and secondary processing installations. Senators had the opportunity to tour several facilities operated by Marine Harvest in and near Fort William including its most recent hatchery, one of its freshwater sites, its processing plant, and one of its grow-out sites by Corran, on Loch Linnhe.

34 For the location of finfish aquaculture sites, see the following **map**.

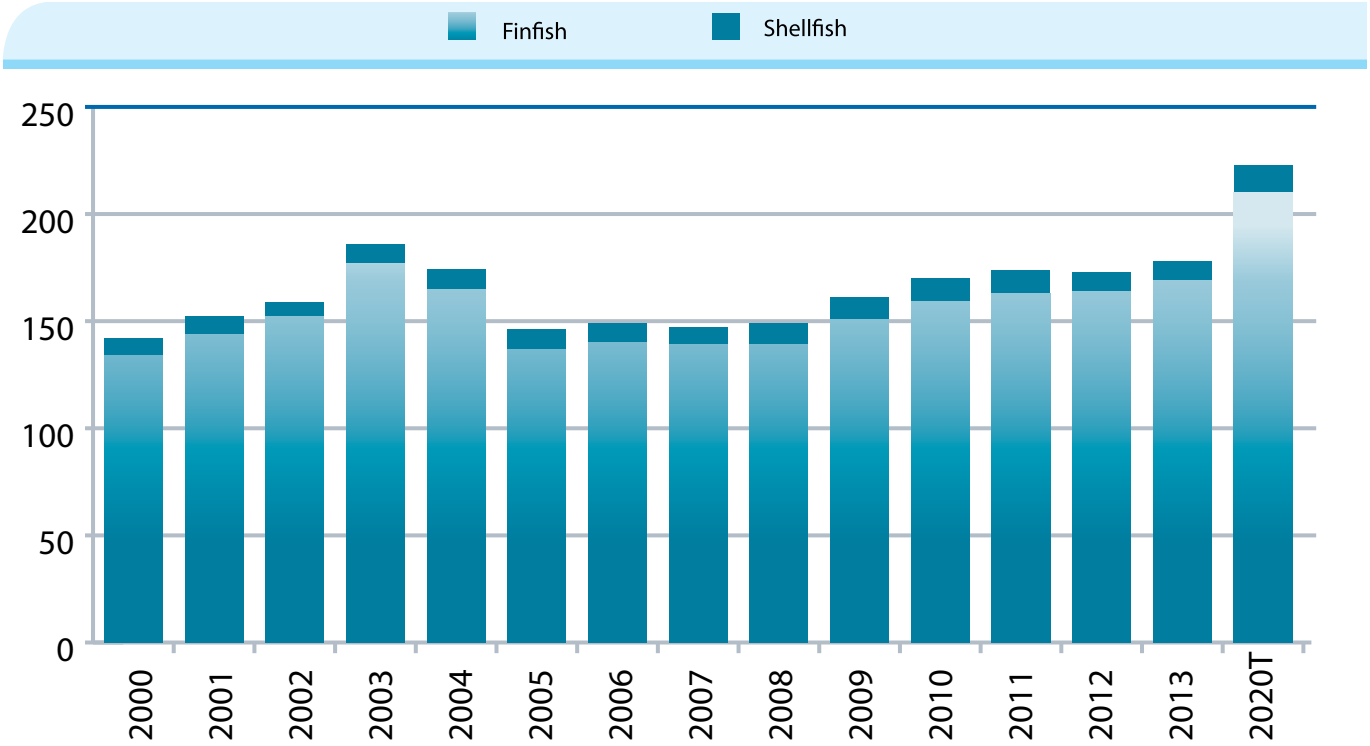
35 Marine Scotland, ***Planning Scotland's Seas – Scotland's National Marine Plan***, Consultation Draft, The Scottish Government, July 2013.

36 Willie Cowan, Head of Performance and Aquaculture, Marine Scotland, *Minutes of Proceedings and Evidence of the Standing Senate Committee on Fisheries and Oceans*, 12 June 2014 (**12:32**).

As in Canada, the shellfish sector in Scotland is highly fragmented and involves several companies, including many small family-operated businesses. There are 369 active sites run by 139 individual businesses. Shellfish aquaculture takes place on the west coast of the Scottish Mainland, as well as in the Western Isles and Shetland.[37] The shellfish sector is dominated by the production of Blue mussels.

There are also a number of small-scale seaweed cultivation sites, either in planning or operation stages in Scotland. These sites are largely located in the Western Isles, Shetland or on Scotland's west coast. They are being developed for algal production trials or as part of integrated multi-trophic aquaculture (IMTA) projects with either finfish or shellfish aquaculture.[38]

Figure 2.1 – Aquaculture Production[a] in Scotland (Thousands of Metric Tonnes), 2000 to 2013 and 2020 Target[b]



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

b. Data for 2013 are preliminary while the year 2020 represents a government/industry target.

Source: Based on data from Marine Scotland Science, ***Scottish Fish Farm Production Surveys***, and ***Scottish Shellfish Farm Production Surveys***, The Scottish Government, various years [accessed 19 March 2015].

37 For the location of the shellfish aquaculture sites, see the following **map**.

38 Marine Scotland, ***Draft Seaweed Policy Statement***, Consultation Document, The Scottish Government, August 2013.

2.1.2 Production

Figure 2.1 presents aquaculture production in Scotland during the 2000–2013 period, as well as a target for 2020. Aquaculture production grew slightly in the beginning of the 2000s and reached a peak at 185,920 tonnes in 2003. This production peak was not achieved again and production declined during the two following years. Production was relatively stable between 2005 and 2008 and then began to increase slightly year after year. In 2013, aquaculture production totalled 177,928 tonnes; this included 168,947 tonnes of finfish and 8,981 tonnes of shellfish. In comparison, Canada produced 130,337 tonnes of finfish and 41,760 tonnes of shellfish.[39] By 2020, Scotland aims to increase production to 210,000 tonnes of finfish and 13,000 tonnes of shellfish.[40]

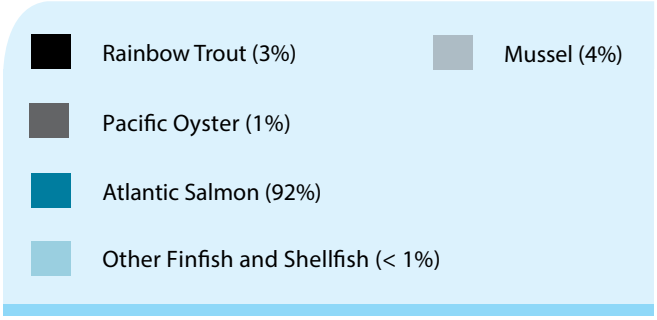
As shown in Figure 2.2, Atlantic salmon is the most aquacultured species in Scotland (92%), followed by Blue mussels (4%) and Rainbow trout (3%).

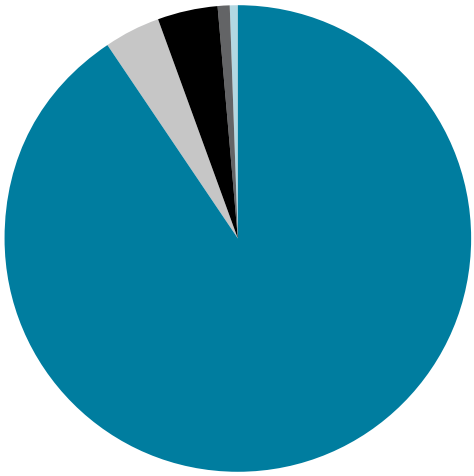
Currently, Scotland is the third largest salmon producer in the world after Norway and Chile. In comparison, Canada is the fourth largest producer of salmon on the global stage. In 2012, the farm-gate value of aquaculture production in Scotland amounted to £559 million (or C$1 billion).

2.1.3 Economic Repercussions

A recent report estimated that the aquaculture industry in 2012 supported 8,000 direct and indirect jobs and generated £1.4 billion (or C$2.6 billion) in the Scottish economy (see Table 2.2). Using the same calculation method, the report further estimated that if the 2020 production target of 223,000 tonnes were met, the industry could

Figure 2.2 – Scotland Aquaculture Production[a] by Species, Percentage, 2013





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

Source: Based on data from Marine Scotland Science, ***Scottish Fish Farm Production Surveys***, and ***Scottish Shellfish Farm Production Surveys***, The Scottish Government, various years [accessed 19 March 2015].

39 DFO, "**Production Quantities and Values**," *Aquaculture* [accessed 19 March 2015].
40 Marine Scotland, ***Planning Scotland's Seas – Scotland's National Marine Plan***, Consultation Draft, The Scottish Government, July 2013 (see Chapter 7).

support 10,000 direct and indirect jobs and generate a turnover value of £2 billion (or C$3.6 billion).

According to the report, the aquaculture industry has a positive effect on social, financial, human and physical capital in the coastal and rural communities where it operates. It generates employment and income which in turn help to maintain community structures, from schools to ferry services, to youth employment. The report further stressed that the impact of the industry extends beyond the remote and economically fragile areas in the Highlands and islands and stretches into cities and the central belt.

Table 2.2 – Economic Impact of Aquaculture in Scotland, 2012 and 2020

	2012	2020
Value of production (million)	£559	£788
Direct and indirect employment	8,000	10,000
Total economic impact (billion)	£1.4	£2.0

Source: Marine Scotland, ***An Assessment of the Benefits to Scotland of Aquaculture***, The Scottish Government, April 2014, p. 139.

The Scottish Salmon Producers Organisation (SSPO), formed in 2006, represents the salmon aquaculture industry in Scotland. It is funded by a voluntary industry levy based on production volume. Senators met with SSPO representatives at the organization's offices located in Perth for a discussion about the Scottish aquaculture industry.

Photos courtesy of: Scottish Salmon Producers Organisation.

2.2 Regulatory and Policy Framework

2.2.1 Siting: Planning and Authorization

In Scotland, the siting process involves a number of steps and several institutions have to provide their permission before a company is allowed to make use of an area for the purpose of aquaculture. The first step is initiated with the planning permission[41] granted by local authorities,[42] as per the *Town and Country Planning (Scotland) Act*.[43] Information required as part of the planning permission process includes: the capacity of an area to accommodate aquaculture development; the visual impact and the effects on the landscape; and infrastructure details (location, site plans, cage and equipment design, other structures, species, stocking density, onshore facilities, etc.). At this stage, it is recommended that the potential effects of aquaculture development on traditional fishing grounds, salmon netting stations and angling interests be also considered. The industry is encouraged to carry out pre-application discussion and consultation with local communities to seek their support in advance of submitting an application. The planning permission process is open to public consultation in which the local communities and district salmon fisheries boards[44] are encouraged to participate.

The second step is the seabed lease, granted by the Crown Estate.[45] To guide its work, the Crown Estate consults two sets of guidelines. The *Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters*,[46] prepared by Marine Scotland, provides guidance on the environmental suitability of coastal areas for marine finfish aquaculture development by identifying three categories of sites – suitable, potentially suitable and unlikely suitable for aquaculture.[47] *The Siting and Design of Aquaculture in the Landscape: Visual and Landscape Considerations*, published by the Scottish Natural Heritage,[48] helps determine the most appropriate location for aquaculture development in relation to the landscape. The Crown Estate may issue a lease for a period of up to 25 years. It may also grant a time-limited lease option for developments still without planning permission. The Crown Estate's decision on whether to grant a lease is conditional upon obtaining two other statutory consents: a licence from the Scottish Environment Protection Agency (SEPA) and another from Marine Scotland.

41 The Scottish Government, ***Planning Permissions***. For operators of sites which were established prior to 2007 (and do not already have planning permission) an application can be made through the Scottish Government.

42 **Local authorities** are equivalent to Canadian municipalities; there are currently 32 of them in Scotland.

43 ***Town and Country Planning (Scotland) Act.***

44 There are 42 district salmon fishery boards in Scotland. These boards are elected by an association of proprietors of salmon fisheries in a salmon fishery district and formed for the purpose of conserving and improving the fisheries and fisheries management within their district.

45 The **Crown Estate** holds Crown lands and property for the benefit of the state. In Scotland, it manages four rural estates, mineral and salmon fishing rights, as well as the seabed out to 12 nautical miles. For a summary of the application process to obtain a seabed lease for the finfish sector, you may consult: The Crown Estate, ***Guidance Notes for Applicants for Leases of Fish Farming Sites in Scotland***, n.d.

46 Marine Scotland, ***Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters***, March 2014.

47 There are currently no locational guidelines available to direct the development of shellfish aquaculture.

48 The **Scottish Natural Heritage** is a government agency established through an Act of Parliament in 1992. Its purpose is to promote the care and improvement of Scotland's natural heritage, as well as to encourage its sustainable use. See Scottish Natural Heritage, ***The Siting and Design of Aquaculture in the Landscape: Visual and Landscape Considerations***, November 2011.

Companies wishing to establish a finfish aquaculture operation must apply for and be granted a licence under the Controlled Activity Regulations (CAR),[49] pursuant to *The Water Environment (Controlled Activities) (Scotland) Regulations*.[50] They must provide environmental data from which a decision on discharge consent can be made. The Crown Estate and SEPA will then submit the proposal to public consultation by advertising details of the development in local newspapers. At this stage there may be objections and, if so, a review process is undertaken. A licence will be granted with conditions that set limits on the biomass (i.e., the weight of fish held on site) and on the amount of certain medicines that can be administered and discharged. The requirement for fallowing (i.e., a period where no fish production occurs on site) will also be a condition of licence. An upper limit of 2,500 tonnes has been set as the maximum biomass per site.

The process of determining what the appropriate size of the grow-out site is for a given location is quite complex. Prior to submitting a formal application, it is recommended that operators discuss their proposals with SEPA for this very reason. This pre-application consultation can limit cost and avoid disappointment should SEPA determine that the proposals are inappropriate for the site concerned. SEPA offers pre-consultation without prejudicing the formal application process. The pre-consultation process presents an

SEPA is Scotland's primary environmental regulator of the marine aquaculture industry. SEPA grants environmental licences that govern the activities of aquaculture operations. Senators met with SEPA representatives who discussed the various roles and responsibilities of the Agency in relation to aquaculture.

Photo courtesy of: Marine Harvest Scotland.

49 SEPA, ***Controlled Activity Regulations***.
50 ***The Water Environment (Controlled Activities) (Scotland) Regulations***.

opportunity to establish the validity of information that subsequently may be required to be submitted and thus minimizes the risk of rejecting incomplete applications.

SEPA may also be required to undertake an Environmental Impact Assessment (EIA) before determining whether a CAR licence may be granted or not. Any new finfish aquaculture operation or extension to an existing finfish operation[51] requires an EIA be undertaken by SEPA where the development is in a sensitive area, is designed to hold a biomass of 100 tonnes or more or covers 0.1 hectare or more in surface area of marine waters.[52]

Finally, as per the *Aquatic Animal Health Regulations*,[53] companies require a marine licence from Marine Scotland to operate finfish and shellfish aquaculture production sites. The application process will consider the impact that an activity will have on the local habitat, and any potential obstructions or dangers to navigation which may arise, either while the works are being carried out or once they have been completed. Licensing of well-boat discharges also falls under Marine Scotland.

Those regulatory agencies involved in the approval of siting for aquaculture operations have signed a Working Arrangement that delineates respective responsibilities in relation to aquaculture and allows for the sharing of relevant information with as view to minimizing overlap or duplication. The agreement covers both shellfish and finfish. This also helps ensure that their respective responses do not provide conflicting advice.[54]

Overall, it is estimated that the decision-making process for the siting of aquaculture operations may take between 18 months and two years, sometimes longer.[55] The industry contends that this process is cumbersome and too lengthy.

2.2.2 Operation, Monitoring and Enforcement

Marine Scotland, a directorate located within the Scottish Government's Department of Rural Affairs and the Environment, is the lead authority for the regulation of aquaculture. As its name suggests, this department has a broad mandate and has overall responsibility for agriculture, fisheries and aquaculture. However, Marine Scotland is not one centralized regulatory agency for aquaculture and there are several other departments and agencies involved in the governance of aquaculture operations.

Marine Scotland is responsible for the main piece of legislation governing aquaculture, the *Aquaculture and Fisheries Act*, which was enacted in 2007 and revised in 2013.[56] Overall, the legislation requires aquaculture operators to compile, retain and make available for inspection information relating to the prevention, control and reduction of fish parasites, as well as information on containment of fish and prevention of escapes. There are

51 Shellfish aquaculture applications do not require an EIA.
52 These aquaculture thresholds are set by ***The Environmental Impact Assessment (Fish Farming in Marine Waters) Regulations (1999)***.
53 ***Aquatic Animal Health Regulations***.
54 ***Working Arrangement – Requirements of Statutory Consultees (Scottish Environment Protection Agency, Scottish Natural Heritage, Marine Scotland Science and the District Salmon Fisheries Boards) and Consultation Protocol for Marine Aquaculture Planning Applications***, 6 July 2010.
55 Willie Cowan, Head of Performance and Aquaculture, Marine Scotland (**12:19**).
56 ***Aquaculture and Fisheries (Scotland) Act 2013.***

also provisions that allow inspections of grow-out sites by fish health inspectors. Inspectors may take samples of fish or material from fish, take copies of documents and records, and carry out tests that they deem necessary. Testing may be used to assess and enforce compliance with the industry's code of practice, undertake scientific or research activities, or investigate escapes. Other provisions establish fixed penalty notices to respond to issues of regulatory non-compliance. The legislation also allows Ministers to establish a scheme to pay some compensation for any fish destroyed for the purpose of disease control.

The 2013 revisions now require aquaculture facilities located within specific areas to operate under Farm Management Agreements (FMA) or Farm Management Statements (FMS).[57] The FMAs or FMS must cover arrangements for managing fish health; managing parasites; moving live fish on and off the grow-out sites; harvesting fish; and fallowing sites after harvesting. These are agreements between all aquaculture companies in the same area to operate in a way that synchronizes their operations so that they stock, treat, harvest and fallow at the same time. This is done to reduce the risk of cross infection caused by their operating in different cycles. These agreements are monitored by Marine Scotland through its Fish Health Inspectorate. Each agreement will be updated about once every two years with a view to making operations more efficient and limiting the environmental impact. The 2013 revisions also include technical requirements for equipment to be used in grow-out sites; these are location specific and cover

Marine Scotland is responsible for the main piece of legislation governing aquaculture in Scotland, the *Fisheries and Aquaculture Act*. Its Fish Health Inspectorate provides advice and diagnostic services to aquaculture establishments and carries out statutory inspections and testing programs on finfish and shellfish grow-out sites throughout Scotland, including unannounced inspections. Senators met with directorate representatives to discuss their regulatory roles in relation to aquaculture and fish health more specifically.

Photo courtesy of: Marine Scotland.

57 An FMA is an agreement between two or more aquaculture operators within a delineated management area, whereas an FMS is used if there is only one aquaculture operator located in a management area or when no agreement has been reached. For more information, see: Scottish Parliament Information Centre (SPICe), ***SPICe Briefing: Aquaculture and Fisheries (Scotland) Bill***, 5 November 2012.

The *Fisheries and Aquaculture Act* does not explicitly define "aquaculture," however the revisions made in 2013 provide the following definitions (section 63):

- fish farm: "any place used for the purposes of fish farming;"
- fish farming: "the keeping of live fish with a view to their sale or to their transfer to other waters; but only where such activity is required to be authorised as an aquaculture production business under regulation;"
- shellfish farm: "any place used for the purposes of fish farming;" and
- shellfish farming: "the cultivation or propagation of shellfish with a view to their sale or their transfer to other waters or land; but only where such activity is required to be authorised as an aquaculture production business under regulation."

physical considerations such as wave height, wind and current speeds.[58] Finally, the 2013 revisions contain measures for the control and monitoring of operations of well-boats.[59]

SEPA also plays a role in the regulation of the finfish sector (but not the shellfish sector). It recently issued a *Guidance Manual on Regulation and Monitoring of Cage Fish Farms*.[60] Marine finfish aquaculture operations are inspected one to three times per year through self-monitoring (this is a condition of the licence) and once annually through SEPA audit surveys. Aquaculture operators must report data to SEPA detailing the scale of the discharges from each of their grow-out sites. The results of both self-monitoring and audit surveys are compared to the pre-defined environmental standards applicable at the site and the impacts of the aquaculture activities are then judged to be satisfactory, borderline or unsatisfactory.

A satisfactory classification requires no further action. Borderline results may require an operator to consider taking further action; this could include a review of the management of the site to improve efficiency of feed use or an extension to the fallowing period. Unsatisfactory classifications indicate that the emissions arising from the site in question are of a scale that is beyond the assimilative capacity of the local environment. This classification may relate to benthic faunal or chemical impacts, unacceptable in-feed medicine residue concentrations or both. Unsatisfactory classifications cannot be ignored and are raised with the operator without delay; this provides an opportunity to discuss the possible reasons for the observed impacts and the steps that may be available to mitigate the immediate effects. SEPA may undertake enforcement action or consider sanctions when a licensed activity has had an unsatisfactory degree of adverse impact upon the marine environment. Enforcement action may include, but is not limited to: an extension of the fallowing period, introduction of an automated feeding system with feedback loops to avoid overfeeding, training of site staff in efficient feeding practices or reduction of licensed biomass, reduction of the quantity or rate of release of a medicine. SEPA recovers part of the cost of its monitoring regime through the levying of charges.

58 Ibid.
59 Ibid. Like in Canada, well-boats are used in the Scottish aquaculture industry primarily for the transport of live fish and in the application of therapeutant treatment for sea lice.
60 SEPA, ***Guidance Manual on Regulation and Monitoring of Cage Fish Farms***.

In addition to the statutory inspections described below, the industry has its own accredited code of good practice for finfish aquaculture which aims to ensure adherence to standards set down within the code. All grow-out sites operated by members of the SSPO are audited against the provisions of the code.[61]

The main departments and agencies responsible for the regulation of aquaculture siting and operation have joined to establish a website – entitled Scotland's Aquaculture – that serves as a single point of access to a database on aquaculture. A wide range of data is provided, such as industry location, leases, licences and reports on controlled activities, shellfish hygiene monitoring, environmental monitoring surveys, fish escapes, sea lice in-feed treatment residues, grow-out sites' monthly biomass, biotoxin monitoring, temporary shellfish area closures, etc. The information is accessible through a data search tool and an interactive map.[62]

2.2.3 Policy Developments

The Government of Scotland released its first Strategic Framework for Scottish Aquaculture in 2003, which was renewed in 2009.[63] That year, it created the Ministerial Group on Aquaculture (MGA) to bring together stakeholders and oversee implementation of the Strategy. The MGA was also involved in developing the legislative changes introduced in 2013. Since then, the MGA has been re-named the Ministerial Group for Sustainable Aquaculture (MGSA), and its work has been refocused on the Scottish Government's growth targets on increasing finfish and shellfish production to 223,000 tonnes by 2020.[64] The MGSA is chaired by the Minister of Environment and involves a broad range of stakeholders. The group aims to work in a collaborative approach in a way that addresses the different views on the impact on the environment. The MGSA is assisted by six working groups examining the following issues: containment, wellboats, interaction, cultured fish health and welfare, capacity, and shellfish. Last year, the MGSA released a national aquaculture research strategy that defines medium (five years) to long term (20 years) research requirements. It is stressed that close collaboration amongst stakeholders coupled with improved coordination of research activities are imperative to ensuring that a sustainable aquaculture industry continues to thrive.[65] In this context, the Scottish Government established the Scottish Aquaculture Innovation Centre (SAIC) in June 2014.[66] Headquartered at the University of Stirling, SAIC brings together industry, academia and other stakeholders to provide innovative solutions with the aim of growing the industry both economically and sustainably. The Centre has received £11 million over five years, with funding from both government and industry.

The Scottish Government recently completed public consultations on how marine resources should be utilized for the purposes of aquaculture as well as for recreational and commercial fisheries.[67] It was explained to the Committee that these three sectors are not mutually exclusive and are all key sectors underpinning sustainable economic

61 SSPO, ***The Code of Good Practice for Scottish Finfish Aquaculture***, 2010.
62 For more information, see **Scotland's Aquaculture**.
63 The Scottish Government, ***A Fresh Start: The Renewed Strategic Framework for Scottish Aquaculture***, May 2009.
64 For more information on the MGSA, see ***The Ministerial Group for Sustainable Aquaculture (MGSA)***.
65 MGSA Science and Research Working Group, ***Aquaculture Science and Research Strategy***, May 2014.
66 **Scottish Aquaculture Innovation Centre**.
67 Marine Scotland, ***Planning Scotland's Seas – Scotland's National Marine Plan***, Consultation Draft, The Scottish Government, 2013.

growth that supports employment and economic well-being of many coastal communities in Scotland. In the coming months, it will launch a National Marine Plan that would bring greater clarity to decision-making regarding the use of the marine environment as a result of these consultations.

As part of the proposed National Marine Plan, aquaculture applications that promote the use of biological controls for sea lice (such as wrasse, a cleaner-fish) will be encouraged. Similarly, proposals that contribute to the diversification of cultured species will be supported. Increased integration of seaweed cultivation with other production in multitrophic systems will also be encouraged. Furthermore, the current SEPA requirement which limits the biomass to a ceiling of 2,500 tonnes per site is being reconsidered with a view to increase the capacity for growth in site sizes. This research could lead to the development of larger aquaculture sites, particularly grow-out sites situated further offshore.[68]

With respect to social acceptance, the government, industry and local authorities are working together to develop a community benefit charter that explains and promotes the benefits brought by the industry to the local economy.[69] The Committee was told that community benefit charters already exist in the renewable energy sector in Scotland. A community benefit charter would aim to maximize the social and economic impact of aquaculture for the community, which could include industry re-investment in the local economy through project funding (such as for housing) or a share of the Crown Estate's income generated from the lease agreements.

2.3 Opportunities and Challenges

The report by Marine Scotland referred to in Section 2.1.3 also examined strengths, weaknesses, opportunities and threats for the aquaculture industry in Scotland. These findings are presented in Table 2.3. Both the finfish and shellfish sectors enjoy a good reputation and are well positioned with their proximity to the European markets. In addition, it is possible to increase fish and shellfish production through the development of offshore aquaculture facilities. Furthermore, growth of the industry is strongly supported by the Scottish Government. However, some factors impede the industry's ability to grow, including a complex regulatory framework.

With respect to the finfish sector, risk of disease and sea lice infestations may affect production levels. In particular, sea lice create significant problems that are costly to companies, due to losses and treatments. The use of cleaner-fish is being considered as part of an integrated pest management approach.

With respect to the shellfish sector, production is relatively expensive in comparison to elsewhere in Europe due to slow biological growth, use of more costly production methods and higher wages. Similarly, there are high capital costs associated with the start-up of a finfish operation, between £5–10 million (C$9–18 million).[70] This makes it difficult for new entrants, particularly in salmon aquaculture. Opportunities exist to develop products in both the finfish and shellfish sectors with a higher market value through further processing.

68 Ibid.
69 Willie Cowan, Head of Performance and Aquaculture, Marine Scotland (**12:24**).
70 Ibid.

Table 2.3 – SWOT Analysis for Aquaculture in Scotland

	Salmonid	Shellfish
Strengths	• A leading producer in the European Union • Close to European markets • Excellent water quality • Consolidated industry • Strong government support	• Good biophysical conditions • A leading supplier of good quality shellfish • Strong local/regional market • Good market recognition • Strong government support
Weaknesses	• Lack of suitable sites • Poor perception of the industry within the press and among some opinion groups • Slow and cumbersome regulatory process • Colder waters contribute to slow growth • Strong competition from Norway which has developed advanced infrastructure • High cost of capital	• Lack of suitable sites • Fragmented industry • Small production units with low economies of scale in comparison with other countries • Lack of access to capital • Colder waters contribute to slow growth • Production costs are relatively higher than elsewhere in Europe
Opportunities	• Scope for growth in offshore sites • Ability to deliver live and fresh fish within 24 hours • Strong demand for some species produced in Scotland • Potential for further value added processing • Potential for species diversification • Use of new technologies	• Increased site productivity • Strong demand for locally produced shellfish • IMTA could expand opportunities for mussel production
Threats	• Reduced output due to disease and sea lice • Failure to continue to improve the sustainability of production going forward • Quality perception of wild fish • A stagnant economy	• A stagnant economy

Note: "SWOT" stands for strengths, weaknesses, opportunities and threats.

Source: Adapted from Marine Scotland, ***An Assessment of the Benefits to Scotland of Aquaculture***, the Scottish Government, April 2014.

CHAPTER 3: Comparative Analysis

3.1 Industry: Structure, Production and Repercussions

The finfish sector in both Norway and Scotland, as well as in Canada, has seen structural changes over the years with consolidation achieved through a number of mergers and takeovers. This has reduced the number of companies operating within the sector in each country. Consolidation of the sector has also helped companies take advantage of economies of scale and strengthened their position on global markets. A few large Norwegian companies are multinational salmon aquaculture corporations that also conduct business in both Scotland and Canada (in B.C.). One large Canadian company operating salmon facilities in all Atlantic Provinces also conducts aquaculture activities in Scotland, as well as in Chile, Spain and the United States (Maine). These large salmon aquaculture companies are all vertically integrated with hatcheries, grow-out sites, feed mills, processing facilities, and marketing operations. In contrast to the finfish sector, shellfish aquaculture in Norway, Scotland and Canada has remained fragmented and involves a large number of companies – including many small family-operated businesses.

Total aquaculture production in Norway is seven times greater than that in Scotland or Canada, due mainly to its high finfish production volume (see Table 3.1). Atlantic salmon represents 94% of all aquaculture production in Norway, compared to 92% in Scotland and 58% in Canada (89% in B.C., 84% in N.L., 96% in N.B., and 74% in N.S.).

Aquaculture is more diversified in Canada than in Scotland and Norway, perhaps because Canada has several marine ecosystems viable for aquaculture in two distinct oceans. Shellfish production in Canada is eighteen times higher than in Norway and almost five times higher than in Scotland. Canada also has more experience with respect to commercial land-based closed-containment systems and IMTA than the two other countries.

Growth of the aquaculture industry is supported by the Scottish Government which aims to produce 210,000 tonnes of finfish and 13,000 tonnes of shellfish by 2020, or an average global growth of 5% per year. The Norwegian Government has not set specific aquaculture production targets but is committed to sustainable industry growth. There are no production targets set by governments for aquaculture in Canada, except in N.L., where the provincial government aims to increase production to 50,000 tonnes of salmonids and 6,000 of mussels by 2018.

Governments in all three countries recognize that the aquaculture industry contributes to economic development in rural regions, most particularly in

Table 3.1 – Aquaculture Production Volume (Metric Tonnes) in 2013

	Norway	Scotland	Canada
Finfish	1,244,180	168,947	130,337
Shellfish	2,363	8,981	41,760
Total	**1,246,544**	**177,928**	**172,097**

coastal and island communities, by providing well paid jobs and ensuring economic vitality. Revitalization is considered particularly critical in areas where other economic opportunities tend to be limited. The economic benefits of the aquaculture industry are wide-ranging and are felt across the countries, including in areas not traditionally associated with aquaculture. In all three countries, there are possibilities for expansion of the industry through access to new sites (both near shore and offshore) and species diversification.

3.2 Regulatory Framework

A review of the aquaculture legislation and regulations in Norway and Scotland and comparisons with aquaculture governance in Canada suggest that:

- Aquaculture is typically regulated by several pieces of legislation involving many regulatory authorities and its governance appears, by its very nature, relatively complex in all three countries. The involvement of different levels of government in Canada adds even more complexity and, from the perspective of the industry, the regulatory framework is cumbersome both during the licence application process and the day-to-day operation of aquaculture facilities. National legislation governing aquaculture in Norway and Scotland ensures that companies operating in various locations within their country are subjected to a uniform and coherent set of regulations. No such national legislation currently exists in Canada.
- Like Canada, the regulation mechanism for aquaculture used in Norway and Scotland is the licensing model. Under this model, aquaculture is prohibited unless licensed. Once licensed, the regulatory framework requires it to be conducted in accordance with the requirements and limitations that are either written into specific licences and/or in the aquaculture legislation, in which case they are applicable to all licence holders operating within the scope of the statutory requirements.
- Approval of a new aquaculture development can be a lengthy exercise. The lack of a streamlined application process is an issue often raised in Scotland and Canada as several licences, leases, permits and approvals are required to operate an aquaculture facility. It is estimated that the licence application process can take between 18 months to two years in Scotland, while it can last two years or more in Canada. In contrast, the aquaculture approval process in Norway is subject to a time limit set in legislation not exceeding 22 weeks.
- The duration of licences and leases differ from one country to another. In Norway, a licence to operate an aquaculture facility is granted in perpetuity and can be sold. In Scotland, the seabed lease is for 25 years and the aquaculture licence is issued for four years; while the environmental licence is not time-limited, it is subject to statutory review every four years. In Canada, the duration of the land tenure, the aquaculture licence and other approvals vary from province to province. For example in N.L., the seabed lease is for 50 years, the navigation approval is given for five years, and the aquaculture licence is issued for one year. In B.C., the lease is for five to 20 years for finfish aquaculture and up to 30 years for shellfish aquaculture, the navigation approval is issued for five years, and the aquaculture licence is currently granted for one year.
- In the three countries, the aquaculture licence determines the maximum biomass permitted per licence. This maximum is set at 780 tonnes per licence in all counties in Norway, except

in Troms and Finnmark where it is fixed at 945 tonnes. In both Scotland and Canada, the maximum allowable biomass for individual sites varies and is determined based on the characteristics inherent to each geographic location and included in the licence documentation. There is however a ceiling of 2,500 tonnes in maximal biomass in Scotland.

3.3 Environmental Impact Assessment and Environmental Monitoring

In Norway, an EIA is required by regulations for new, large salmon aquaculture operations. In Scotland, SEPA may be required to undertake an EIA before determining whether a CAR licence can be granted or not. Any new finfish aquaculture operation or extension to an existing finfish operation requires an EIA undertaken by SEPA where the development is in a sensitive area, is designed to hold a biomass of 100 tonnes or greater or covers 0.1 hectare or more in surface area of marine waters.

In Canada, prior to 2012, many proposed aquaculture operations were subjected to a federal EIA under the *Canadian Environmental Assessment Act*. However, amendments in 2012 to this Act as well as to the *Navigable Waters Protection Act* (now the *Navigation Protection Act*) removed the federal requirement for an EIA. An EIA may still be required at the discretion of the federal Minister of Environment, or at the discretion of provincial governments (in N.B., N.L., and P.E.I.). Conditions for requiring a provincial EIA are unclear since provincial regulators previously relied on the federal screening to identify potential significant environmental impacts. The *Environmental Protection Act* in N.L. appears to include the most comprehensive EIA triggers for proposed aquaculture operations in the country.

In the three countries, the environmental monitoring of aquaculture operations is established by legislation or regulations, is comprehensive (e.g., bottom sediment, water analysis, net testing, sea lice counts, fish health provisions, use of treatments), and is carried out on a regular basis by operators as well as by regulatory authorities for assessment of compliance and enforcement purposes. This is in addition to aquaculture practices – fallowing, site rotation, single-year class production, prescribed distances between sites – implemented to prevent the cumulative degradation of the environment and limit disease transmission.

Sea lice and escapes are considered to be the two most important environmental challenges facing the aquaculture industry in both Norway and Scotland. In Canada, sea lice, disease outbreaks and escapes (on the East Coast) also raise serious environmental concerns. Aquaculture regulators from the three countries acknowledge that environmental sustainability is a prerequisite for the long term development and growth of the industry.

3.4 Protection of Wild Atlantic Salmon Stocks

Norway has established 52 National Salmon Rivers and 29 National Salmon Fjords and, within these areas, the salmon aquaculture industry is subject to stricter legislation. All aquaculture operations in National Salmon Fjords are monitored every year. Similarly, Scotland has introduced a presumption against further marine salmon aquaculture on its north and east coasts to safeguard wild migratory species. This extensive zone covers a large proportion of the coastline of Scotland and its most highly productive salmon river catchments. For its part, Canada has 34 Atlantic Salmon Management Areas (SMAs) which group neighbouring rivers for wild stock management purposes. Marine salmon

aquaculture only occurs in six SMAs (SMA 23 in N.B., SMA 11 in N.L., and SMA 19, 20, 21, and 22 in N.S.).[71]

3.5 Reporting Industry Information to the Public

In Norway, information on a wide range of diseases and parasites affecting cultured and wild fish is routinely collected by the Norwegian Veterinary Institute and made available to the public on an annual basis. Data on the use of pharmaceuticals by the aquaculture industry is also published annually by the Norwegian Institute of Public Health. Furthermore, data on escapes from aquaculture facilities are published regularly by the Department for Fisheries and Aquaculture.

Scotland's Aquaculture website, launched in 2013, makes aquaculture regulatory information accessible through a data search tool and an interactive map. A wide range of data is made available there, such as industry location, reports on controlled activities, monthly biomass, escapes, sea lice infeed treatment residue levels, and more. In addition, Marine Scotland's Fish Health Inspectorate proactively publishes operational activity data on its website.

In Canada, given federal and provincial responsibilities over aquaculture, there is no single agency reporting information about the industry to the public. The availability of data shared with the public and the extent of the information provided vary from one province to another. In general, there is a concern in Canada about a lack of reporting of information regarding the aquaculture industry, particularly on disease outbreaks, the use of chemicals, escape events and the impacts on the benthic environment. It is also argued that, when information is made available, it is not released in a timely fashion. This concern is being addressed to some extent by DFO. Under the proposed *Aquaculture Activities Regulations*, aquaculture operators would be required to report on an annual basis the use of drugs or pest control products, the purpose of their use, the date and quantity used, and a record of consideration of alternative treatments, and the monitoring results of sediments on marine finfish facilities located over soft bottom ocean substrates. The regulations would also require the monitoring of impacts from aquaculture-related activities to fish habitat and establish conditions under which samples are to be collected and analyzed for pest control products in cases of unusual morbidity or mortality. This information would be reported annually to DFO and made public. This would be in addition to information that is already available on provincial regulatory authorities' websites as well as on DFO's website in relation to B.C. aquaculture.

3.6 Research

One message that the Committee consistently heard throughout its public hearings and site visits, in Canada and abroad, is that the future of aquaculture is dependent upon research that leads the way to economically efficient and environmentally sustainable methods of production. Therefore, governments must ensure that sustainable management of aquaculture operations is science-based, while industry must actively participate in research and development efforts directed toward environmental sustainability. This can only be achieved through collaboration between scientists and researchers from government departments, academia and the industry.

71 DFO, ***Focus Area Report on Aquaculture, Introductions and Transfers, and Transgenics***, January 2010, p. 19.

In Norway, there is a tradition of strong collaboration between the industry, the regulatory authorities and academia as it pertains to aquaculture research. The Committee was told that cooperation and exchange of information between government, researchers and the industry contributes to making Norwegian aquaculture innovative and leading-edge. The results of this collaborative research are used to reform the regulatory regime and change production practices. Scotland, like Norway, aims to foster collaboration among universities, businesses and other stakeholders in aquaculture research and, recently, it established the Scottish Aquaculture Innovation Centre. The Centre brings together industry and academia to provide innovative solutions with the aim of setting conditions for the industry to grow economically and sustainably.

There is also a strong foundation for aquaculture research in Canada. At the federal level, several departments and agencies fund and/or carry out aquaculture-related research. Within DFO, about half of the budget under the Sustainable Aquaculture Program is allocated to research. During site visits throughout Canada, the Committee visited several research facilities performing world-class research and development in a wide range of fields related to aquaculture. The need to foster cooperation and collaboration among the various stakeholders was often noted as an aspect to be improved. Of particular interest was the priority given to research in N.L. as part of the provincial aquaculture strategy launched in 2014: an advisory committee has been established to review current research activities in the province and to provide recommendations to further collaboration among the research community.

3.7 Social Licence

Norway, Scotland and Canada are confronting the same environmental issues in relation to aquaculture, including organic waste production, disease, use of therapeutic agents and chemicals, escapes from aquaculture operations, bio-fouling management, and sustainability of feed ingredients. It is clear that the three countries aspire to balance the growth of a viable aquaculture industry with the issue of environmental protection and social acceptance at the local or regional level. For example, the green concessions issued to salmon producers in Norway aim to encourage and favour the development of more environmentally friendly methods of production, such as alternative feed sources, cleaner-fish, tarpaulins, snorkels, and more. In Scotland, the government is supporting the use of "greener" methods of production, such as cleaner-fish and IMTA, while developing a community benefit charter that will explain and promote the benefits generated by aquaculture at the local level. The Scottish Government is also creating marine development plans where aquaculture can be better integrated with commercial and recreational fisheries. In Canada, broad public consultation processes were completed in 2014 in N.L. and N.S. with a view to implementing new aquaculture regulatory regimes that foster continued aquaculture development along with improved social licence.

CONCLUDING REMARKS

Aquaculture is an industry that have been well established in Norway and Scotland since the beginning of the 1970s. In many respects, the Norwegian and Scottish aquaculture industries – their structure and governance – are comparable to that of Canada. The Canadian aquaculture industry is, however, younger and subject to a more complex regulatory framework, which is the result of legislation and regulations emanating from two levels of government. Aquaculture governance also appears more complex in Canada because the division of roles and responsibilities between the federal government and the provinces vary from one jurisdiction to another. Despite these differences, there is opportunity for Canada to learn lessons from the regulatory and operational developments taking place in Norway and Scotland in relation to aquaculture. The Committee carefully reviewed the Norwegian and Scottish experiences in developing a set of recommendations on aquaculture governance in Canada.

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