Import Controls under the National Aquatic Animal Health Program (NAAHP): A Preliminary Assessment on Trade and Opportunities for Nova Scotia Fisheries

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31 December 2013

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ACKNOWLEDGEMENTS

I would like to take a moment and express sincere gratitude to a number of people without whom this project wouldn't have proceeded forward.

I would like to thank my supervisor, Evert Lindquist, for agreeing to become my supervisor, and of course, for being so patient and supportive. As well, I would like to explicitly note here that Evert was very generous with his time throughout this whole process, and I will forever be very grateful to him for that.

I am equally indebted to my client, Jean-Willy Ileka, for everything that he has done for me, starting from when he decided to hire me as a summer student for his team. As well, I would like to thank Kim Speers for all her guidance with regards to the Master's Research Project requirements, as well as for agreeing to be a second reader. Also, I would like to thank Lynne Siemens for agreeing to Chair of the oral defence session. And last, but certainly not least, I would like to express an utmost gratitude to Judy Selina, Graduate Administrative Assistant, for being the best supporting staff a student could ever wish for. Judy, thank you so much for taking care of me, and for always being willing to help.

And as for non-UVIC people, I would also like to express my sincere appreciation and gratitude to my family and friends. Their support certainly meant a lot.

EXECUTIVE SUMMARY

This report assesses the impact of the implementation of the import control section of the National Aquatic Animal Health Program (NAAHP) on Nova Scotia fisheries, in terms of trade. NAAHP is a science-based regulatory program co-delivered by the Canadian Food Inspection Agency (CFIA) and the Department of Fisheries and Oceans (DFO). Import control makes up one of its pillars. NAAHP is a new intervention by the federal government introduced in order to meet Canada's international obligations as a member of the World Organization for Animal Health (OIE).

Effective December 10, 2010, reporting of specified aquatic animal diseases to CFIA by the relevant parties, such as fisherpeople and laboratories, is mandatory, depending on their level of severity. Effective December 10, 2011, import permits are required for imports of specified crustaceans, molluscs, and finfish species – aquatic animals that could be affected by these diseases. Imports of specified aquatic animal species would be allowed entry into Canada only if they would be certified as free of listed diseases.

During the consultation period prior to NAAHP regulations came into force, the Governments of Canada and Nova Scotia agreed to assess the impact of the import control section of NAAHP on the Nova Scotia fisheries sector. This project is to assess the economic impact of the import control section of NAAHP on Nova Scotia fisheries, in terms of trade. This report was guided by the following research question: How will the import control section of NAAHP likely impact the Nova Scotia fisheries, in terms of trade?

The methodology for answering this research question will involve a literature review and a qualitative assessment of the impact of the import control section of NAAHP on trade for Nova Scotia fisheries. This assessment will be carried out using a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis looking at various domestic economic indicators (ex. GDP, number of establishments, etc.) and international trade statistics for the Nova Scotia fisheries.

The data sections (Nova Scotia Profile: Domestic Statistics and Nova Scotia Fisheries Profile: International Trade Statistics) quantify the importance of the Nova Scotia Fisheries sector and international trade to the province of Nova Scotia. The domestic statistics section will use various domestic economic indicators, demonstrates the significance of the Fisheries sector to Nova Scotia. The international trade section affirms the importance of the international trade, quantifying the link between the imports and exports through the import content of exports.

The Strengths, Weaknesses, Opportunities, and Threats assessment is a preliminary impact of the implementation of NAAHP:

- Strengths: Maintaining Nova Scotia fisheries sector's dominant position and rankings in comparison to other provinces, as well as maintaining market access for Nova Scotia's Fisheries exports.

- Weaknesses: Costs of new import permits could be passed to customers. Challenges for Nova Scotia-based importers of aquatic animals due to developing countries' short-term and medium-term challenges in meeting NAAHP's regulatory standards.

- Opportunities: Consistent with international aquatic animal health measures policy trends. Improved marketability and quality of fish and seafood imports.

- Threats: Possible adjustment-related challenges for Nova Scotia importers. Losses of market access should there be a unilateral declaration of exports ban by one or more of Canada's trading partners.

This report also notes that there is insufficient data needed to provide accurate and up-to-date information about the sector for the Governments of Canada and Nova Scotia. To bridge the gap, the following three options were identified:

- **Option 1: Find a better way to co-ordinate existing resources**

- **Option 2: Commissioning research to close the data and literature gaps**

- **Option 3: Better analysis of data**

These options were evaluated in the context of their benefits, costs, effectiveness, and feasibility for CFIA and Nova Scotia.

While Option 3 is the recommended option, Options 1 and 2 would have to already have been put in place in. Pursuing Option 3 would take advantage of new streams of data and result in better research, leading to more informed decision making and policy planning. Subsequently, the report proceeds with the Implementation Plan for this option.

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1. INTRODUCTION

On December 22, 2010, the Regulations *Amending the Health of Animals Regulations* were published into *Canada Gazette* II. This report will assess the impact of the implementation of the import control section of the National Aquatic Animal Health Program (NAAHP) on Nova Scotia Fisheries in terms of trade. Import controls were part of these amendments which made the NAAHP fully operational. During the consultation period between the pre-publication in *Gazette I* and the publication, the federal government and Nova Scotia agreed to work on an assessment of the impact of the import control section of these regulations on Nova Scotia fisheries sector (Government of Canada, 2010). Subsequently, it was determined that this assessment could be carried out by a summer student.

My main client is the Economic Affairs Unit within the Canadian Food Inspection Agency (CFIA). The Economic Affairs Unit conducts economic analysis of proposed regulations and other initiatives falling under the CFIA domain. Therefore, assessment of the introduction of a new regulation, the import control section of NAAHP falls under the purview of my client. Also, this assessment involved working closely with scientists and other specialists from the Animal Import/Export Division of the Animal Health Directorate, responsible for the day-to-day management of NAAHP operations.

The other clients are from the Business Development and Economics Division in the Industry Development and Business Services Branch of the Nova Scotia Department of Agriculture and the Marine Advisory and Coastal Advisory Services Section of the Marine Division within the Nova Scotia Department of Fisheries and Aquaculture. The Business Development and Economics Division provides professional economic analysis and expert business development support to the Nova Scotia agri-food and seafood industries. The Marine Advisory and Coastal Advisory Services Section provides research, analysis, advice, legislative administration, policy/strategy development and inter-governmental issues on all aspects of marine commercial fisheries and coastal issues from the provincial perspective and jurisdiction.

The purpose of this project is to assess the economic impact of the import control section of NAAHP on Nova Scotia fisheries, in terms of trade. The research question guiding this study is: How will the import control section of NAAHP impact the Nova Scotia fisheries in terms of trade? The methodology for answering this research question will mostly come through a qualitative assessment of the impact of the import control section of NAAHP on trade for Nova Scotia fisheries. Whenever available and where applicable, a quantitative assessment was conducted, using measurable and quantifiable data. This will provide more detailed and evidence-based understanding of the impacts of the implementation of the import control section of NAAHP on Nova Scotia fisheries, from the trade angle. In accordance to input received from the Nova Scotia officials, the assessment will focus on wild/capture fisheries segment of Nova Scotia Fisheries sector due to its relative importance and market share. Therefore, while aquaculture will be discussed and mentioned throughout the report, it would not be a focus of this report due to its relatively small market share and economic significance to Nova Scotia.

The assessment will be carried out using a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis framework. Traditionally, SWOT analysis is used as a strategic planning tool to assess the competitiveness of a particular sector, industry, and/or organization (Bryson, 1988, p. 76). Here, it will be used to assess the impact of implementing a specific regulation, the import control section of NAAHP. This will be done through looking at various domestic economic indicators (ex. GDP, number of establishments, etc.) and international trade statistics for the Nova Scotia fisheries. Subsequently, that data would help form the basis for the assessment of the impact of the implementation of the import control section of NAAHP on the Nova Scotia fisheries. Such assessment can only be preliminary. For a more comprehensive and complete assessment, other approaches such as a Cost-Benefit Analysis (CBA) would be more appropriate. However, such analysis would be possible only *ex post* as more information and data related to the imported fish and aquatic animal diseases comes available.

This report begins with the Introduction, Background, and Methodology sections. The findings are reported in the Literature Review section and Domestic and International statistics for Nova Scotia Fisheries (Sections 5 and 6). Afterwards, the reader will be introduced to the assessment data and information through the domestic and international statistics sections for the Nova Scotia Fisheries. Those sections will be followed by the SWOT analysis section, putting together successive sections and analyzing all of the findings. Options for filling the data gaps are set out in Section 9, along with the implementation plan for the recommended option. A conclusion summarizes key findings and suggests further avenues of research.

2. BACKGROUND

This section contains the background information about the National Aquatic Animal Health Program (NAAHP), some details on the clients and their roles and responsibilities in connection to this assessment.

2.1 National Aquatic Animal Health Program (NAAHP)

The National Aquatic Animal Health Program (NAAHP) is a science-based regulatory program co-delivered by the Canadian Food Inspection Agency (CFIA) and the Department of Fisheries and Oceans (DFO). CFIA provides the overall program lead and "is responsible for the disease surveillance/monitoring protocols and control measures for reportable diseases." Meanwhile, "DFO is responsible for diagnostic research and the provision of scientific advice, and delivery and oversight of the National Aquatic Animal Health Laboratory System (NAAHLS)." NAAHP was announced by the federal government in 2005. As part of the NAAHP implementation plan, CFIA received $32 million in new funding for the first five years, until 2010, and $7.5 million in ongoing annual funding thereafter. DFO received $26.9 million in new funding over the same five-year period, followed by the $3.9 million in subsequent years (CFIA, 2011).

Import control measures are some of the regulations introduced under the NAAHP. They are the focus of this report. Effective December 10, 2011, a year after the registration of *Regulations Amending the Health of Animals Regulations* in *Canada Gazette*, import permits are required for imports of specified crustaceans, molluscs, and finfish species – aquatic animals that could be affected by these diseases. Imports of specified aquatic animal species would be allowed entry into Canada only if they would be certified as free of listed diseases (in Schedules VII and VIII). Other measures include mandatory reporting of specified aquatic animal diseases to CFIA, upon discovery, by fisherpeople and others who might come across such information. Additionally, CFIA plans to hold consultations with stakeholders regarding developing regulations governing the inter-provincial movement of these aquatic animals.

NAAHP's authority comes through amendments to the *Health of Animals Regulations*, published in Canada Gazette, under the authority of the *Health of Animals Act.* These were introduced to establish a new national regulatory framework for crustaceans, molluscs, and finfish species of aquatic animals. This was an intervention by the federal government into an area previously not subject to such regulations. However, the federal government is not starting from scratch because the intervention is modelled on a national regulatory framework for terrestrial animals (CFIA, 2011).

These regulations allow Canada to maintain international standards for national aquatic animal disease management, and thus fulfil its obligations to the World Organization for Animal Health (OIE). The OIE has 175 member countries and functions as the international standard-setting body for the World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement), as applied to animal health. The WTO recognizes CFIA as Canada's Competent Authority for

animal health and, therefore, “this regulatory intervention allows Canada to meet international trade standards and prevent the loss of aquatic resources due to the introduction or spread of disease and to ensure access to international markets for Canadian exports” (Government of Canada, 2010).

Developing this new national aquatic animal health regulatory framework is consistent with practice in other jurisdictions, including developed and developing countries. These new regulations will help Canada maintain or increase market access for its fish and seafood exports: “Increasingly stringent international standards are driving seafood importing nations to require Canada to certify health (disease) status, not just food safety, of live aquatic animals and their products” (Government of Canada, 2010). The absence of these regulations would prevent Canada from meeting the OIE standards, and would prevent expanding and even maintaining current levels of market access for its exports.

2.2 Background on Client Organizations

The Canadian Food Inspection Agency (CFIA) is “Canada's largest science-based regulatory agency”. It “is dedicated to safeguarding food, animal, and plant health, which enhances the health and well-being of Canada's people, environment, and economy”. Overall, “the CFIA bases its activities on science, effective risk management, commitment to service and efficiency, and collaboration with domestic and international organizations that share its objectives” (CFIA, 2013). This project was carried out primarily for the Economic Affairs Unit of the Regulatory, Legislative, and Economic Affairs Division of CFIA’s Domestic Policy Directorate.

The Economic Affairs Unit conducts economic analysis of proposed regulations and other initiatives falling under the CFIA domain. Assessment of the introduction of a new regulation, such as the import control section of NAAHP, falls under the purview of the Economic Affairs Unit. This assessment also involved working closely with scientists and other specialists from the Animal Import/Export Division of the Animal Health Directorate. The Animal Import/Export Division is responsible for managing NAAHP’s day-to-day operations.

The mandate of Nova Scotia Department of Agriculture is to support the “development of competitive, sustainable and profitable agriculture and agri-business industries that contribute to the economic, environmental and social prosperity of Nova Scotia” (Nova Scotia Department of Agriculture, 2013). The client is comes from the Business Development and Economics Division in the Industry Development and Business Services, which provides professional economic analysis and expert business development support to the Nova Scotia agri-food and seafood industries. The NAAHP file was assigned to the Division due to its mandate for providing economic analysis and business development support to the Nova Scotia seafood industries.

The responsibility of the Nova Scotia Department of Fisheries and Aquaculture “is to manage, promote, support and develop the fishing, aquaculture and seafood processing industries of this province” (Nova Scotia Department of Fisheries and Aquaculture,

2013). Here the client is the Marine Advisory and Coastal Advisory Services Section of the Marine Division, which provides research, analysis, advice, legislative administration, policy/strategy development and inter-governmental issues on all aspects of marine commercial fisheries and coastal issues from the provincial perspective and jurisdiction.

2.3 State of Understanding of the Nova Scotia Fisheries

At the time of the writing of this report, the significance of the Fisheries sector, especially of its exports, was generally known to Nova Scotia, the federal government, stakeholders, and the general public.

When entering into the agreement with the federal government concerning carrying out an assessment of the impact of the introduction of the import control section of NAAHP, the significance of fish and seafood exports was very well known to Nova Scotia as well as the link between imports and exports, through the use of imported inputs in fish and seafood processing. However, even though the use of imported fish and seafood inputs in domestic processing and value-adding activities was recognized, it has not been quantified. And, while the importance of exports to Nova Scotia has been widely stated, the importance of imports has not been indicated (Nova Scotia Department of Fisheries and Aquaculture, 2011).

There were no academic studies concerning the impact of the introduction of aquatic animal health regulations on trade. That necessitated broadening the literature review scope to looking at the entire Sanitary and Phyto-Sanitary Standards (SPS) and Technical Barriers to Trade (TBT) measures on trade. Also, little was known about the potential impact of new aquatic animal health regulations on maintaining market access for exports, or the impact of imported inputs in mitigating the commonly understood negative effect of the Canadian dollar's appreciation on exports, or the economic impact of disease outbreaks as a result of imported aquatic species.

In short, to assess the impact of the implementation of NAAHP on Nova Scotia fisheries requires obtaining more data and information, along with an analytical framework to put all of that together and carry out the assessment. To that end, SWOT was chosen as a tool for undertaking an assessment.

2.4 Opportunities and Risks for the Nova Scotia Fisheries

Although Nova Scotia fisheries sector's domestic economic performance and international trade statistics data was available, it was insufficient to estimate the preliminary impact of the introduction of the import control section of NAAHP. An exploratory assessment was needed to inform policy planning.

The SWOT analysis framework (Strengths, Weaknesses, Opportunities, and Threats) was chosen as a framework assessing of the impact of introducing a new regulation from the sector competitiveness perspective. This includes looking at potential benefits of NAAHP, such as maintaining market access for Nova Scotia Fisheries exports. Strengths

and Weaknesses will be used to assess internal factors, while Opportunities and Threats were used to assess external factors. SWOT framework allows assessing the preliminary impact of implementing the import control section NAAHP on Nova Scotia Fisheries from the perspective of fisheries sector's competitiveness. On the whole, the SWOT analysis will provide the conceptual framework that will establish and demonstrate the link between Nova Scotia's participation in international trade with maintaining sector competitiveness. For more information about the SWOT analysis and its uses, please refer to Appendix A.

Two examples of SWOT analysis were identified, which were used to assess the implementation of the Hazard Analysis Critical Control Point (HACCP), a national food safety regulatory framework, in Madagascar and the United Arab Emirates, respectively (Gilabert, Sarter, and Sarter, 2010; Al-Kandari, and Jukes, 2011). However, in both cases SWOT was used to assess structures and context for the implementation of a specified regulation, rather than the impact of its implementation.

The SWOT is not the only tool available to assess the competitiveness. Porter's Five Forces Strategic Framework was initially considered to be utilized as the framework for carrying out the assessment, but it was determined to be less appropriate in comparison to SWOT. The Porter Framework is typically used "for identifying the sources of competitive advantage in a relevant market", and determining the likelihood of sustainable profitability for a particular industry or line of business through five factors: the threat of substitutes, the threat of entry, the power of buyers, the power of suppliers, and the intensity of rivalry (Harris, McGuigan, & Moyer, 1999, p. 423). Even though the competitiveness of an industry or a particular line of business is assessed, this is done at the firm level, from the micro-level perspective. This does not fit the context of this assessment, as it involves looking at the impact from the macro and sectoral perspective. Also, unlike SWOT analysis, Porter's Five Forces Model does not directly assess the regulatory environment and other external factors. Without taking into account external developments and context, the type of analysis necessary to assess the impact of the import control portion of NAAHP for Nova Scotia fisheries would not be possible.

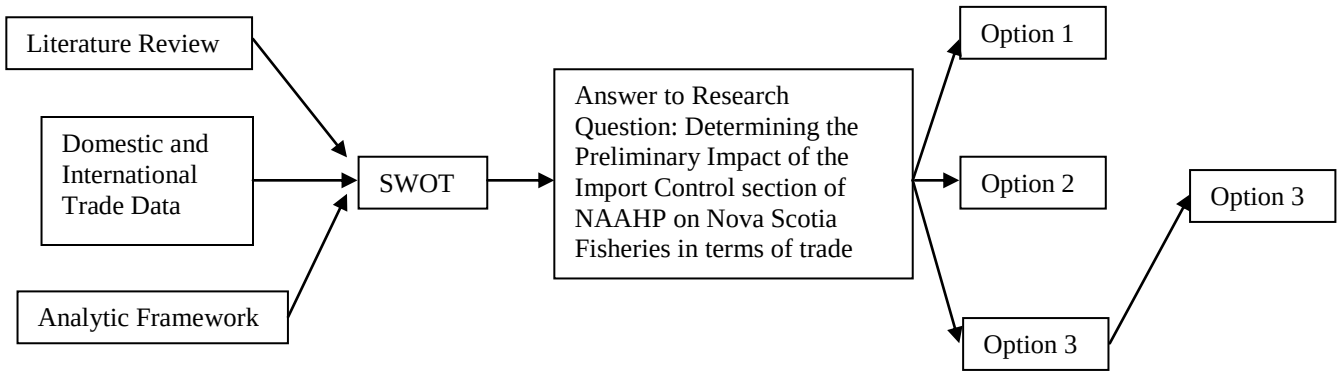
2.5 The Focus of this Study: From Background to Approach

In order to determine the potential impact of the import control section of NAAHP on the Nova Scotia Fisheries sector, it is necessary to conduct a literature review of what was done in other jurisdictions, and a profile of the sector's domestic economic performance and international trade data. Once the needed data and information is gathered, it is important to have an analytical framework to put in an assessment to organize and link this data, and another framework (SWOT) to assess the implementation going forward.

3. METHODOLOGY AND METHODS

This report uses a mixed-method approach. The qualitative methodology included a literature review and data obtained from several publications and databases. This research was carried out exclusively by the author. However, decisions on strategy and approaches utilized in this research were taken in consultation with the main client from the CFIA, as well as other CFIA and Nova Scotia colleagues. Below is the summary figure, describing what the report does.

Figure 1: Summary Figure of the Report



3.1 Literature Review

The literature review was carried out using a variety of sources, relying predominantly on the academic and grey literature. The intent was to find data and information that would be helpful in assessing the impact of the import control section of NAAHP on Nova Scotia fisheries, in terms of trade. Academic literature was primarily utilized to build and develop conceptual foundation for this assessment, as well as to access a detailed research into all of the relevant themes. These themes included aquatic animal health policy developments in other jurisdictions, import content of exports concept, impact of aquatic animal health regulations, and international aquatic animal health governance structure. No academic literature directly assessing the impact of introducing new aquatic animal health regulations on trade was found, so the scope was broadened to examine the impact of the impact of the entire Sanitary and Phyto-Sanitary Standards (SPS) and Technical Barriers to Trade (TBT) measures on trade. Academic literature was sourced from the University of Victoria library and Google Scholar databases.

Grey literature was primarily accessed in order to get the actual data and statistics, which would form the quantitative foundation for the SWOT analysis. These included statistical publications by governments and non-governmental organizations, such as think-tanks. However, that information on some topics, most notably, the import content of exports, was obtained from both academic and grey literature publications.

3.2 Sources of Data

Academic literature was accessed through the use of University of Victoria databases and Google Scholar. These resources were searched mostly by keywords and/or by the author. Some publications were discovered as a result of browsing through the references of other documents. When coming across the source that was considered to be relevant, the examination would typically begin with the abstract. If warranted, a more detailed and in-depth examination would follow.

Grey literature was also accessed on the basis of relevance to the research question. The searching approach was not unlike the approach taken towards finding sources from the academic literature, as a keyword search was utilized. Government publications included reports from departmental web-sites, as well as public sector organizations, such as Statistics Canada.

Some government documents were internal and, at the time of the writing of this report, not publicly available. One example is *A Business Case in Support of a National Aquatic Animal Health Program*, a document produced by the Department of Fisheries and Oceans (DFO) in 2002, which made the case for the establishment of NAAHP (DFO, 2002). Another internal document was market assessment of Nova Scotia Fisheries, carried out by the Nova Scotia Department of Fisheries and Aquaculture in part through asking the industry to complete a questionnaire (Nova Scotia Department of Fisheries and Aquaculture, 2011).

Some data was obtained upon request. For example, some international trade figures for Nova Scotia and Canada were obtained through an e-mail request to the Atlantic Provinces Economic Council (APEC).

3.3 Organizing Findings: Analytic Framework

The analytical framework, to be introduced in the sub-section 4.12, was developed based on the findings flowing from the literature review. The framework is based on the sources of data that would form the conceptual foundation and basis for the analysis that will be carried out in this report.

3.4 Future Assessment: SWOT Analysis

The preliminary assessment of the implementation of the import control section of NAAHP on trade for Nova Scotia fisheries sector will be carried out using the SWOT methodological framework.

3.5 Strengths and Limitations of Methodology

A mixed-method methodology was utilized in this report. The qualitative methodology included a literature review, domestic and international trade data, analytic framework, and SWOT. This multi-approach method enabled the author to produce a preliminary

assessment of impact of the implementation of the import control section of NAAHP on Nova Scotia Fisheries, and thus, answer the research question.

However, the qualitative aspect of this assessment makes the assessment exploratory. As noted in Section 1.0, too little data and insufficient detailed risk assessment precluded the use of CBA, which would lead to a more comprehensive and quantitative assessment. The Options and Conclusion sections (Sections 9 and 10, respectively) identify strategies for overcoming this limitation in the future.

4. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

This section begins with an extensive examination of the literature on trade, specifically, at the links between exports and imports, which provides the conceptual foundations on which the fisheries sector. These links are fundamental in establishing the appropriate context of the NAAHP.

The literature review will start by examining the "import content of export" concept, critical for understanding the basis of international trade. It will be followed with the examination of the Canadian and non-Canadian import content of exports publications. We then turn to the literature on the impact of food safety and animal health regulations on trade for developed and developing countries. That will be followed by looking at the economic considerations influencing exports and imports of fish products, such as the effect of currency exchange rates on imported intermediary inputs and prices of fish and seafood products. The international aquatic animal health governance structure will be examined, as well as policy developments concerning aquatic animal health regulatory frameworks in other countries and economic considerations behind their introduction. The literature review closes by examining the availability of information on the economic impact of diseases in aquaculture and wild-based aquatic animals.

4.1 The Import Content of Exports Concept

Three publications provide the conceptual foundation and a basis for understanding the links between imports and exports, where imports function as facilitators and enablers of exports (Krugman, 1993; Hummels et al., 2001; Reimer, 2011). What follows considers each in turn in more detail.

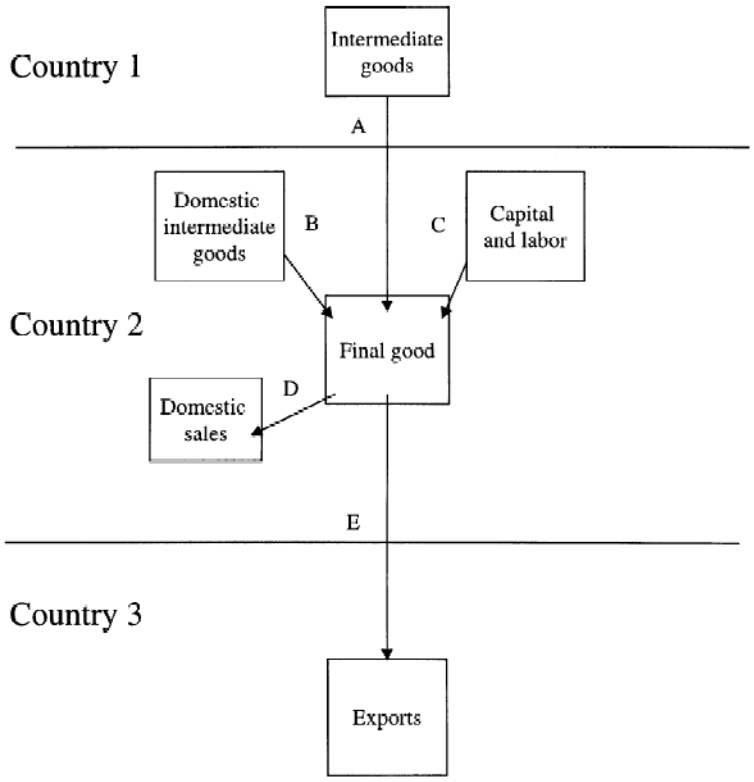
Krugman (1993) states that the "International trade is not about competition, it is about mutually beneficial exchange. Even more fundamentally, (...) imports, not exports, are the purpose of trade. That is, what a country gains from trade is the ability to import things it wants" (p. 24). This establishes conceptual foundation regarding the importance of imports, which will be utilized in the context of assessing the impact of the import control section of NAAHP on Nova Scotia, through the sectoral competitiveness lenses.

Hummels et al. (2001) is the first publication to propose a new methodology for quantifying a continuum (below) that links imports to exports. They sought to reflect the new globalization-driven reality of fragmented production, which is said not to be adequately captured through conventional calculation methodologies for trade statistics. These globalization-driven changes in methods of productions are described in the context of a vertical specialization concept. Hummels et al. (2001) observed that "Production processes increasingly involve a sequential, vertical trading chain stretching across many countries, with each country specializing in particular stages of a good's production sequence" (p. 75). As such, their study focuses on documenting the use of intermediary imported inputs in producing goods that are subsequently exported, and their implications in trade growth. They find increased uses of imported inputs in exported goods since 1970. They also find vertical specialization and value-adding

activities to be significant factors in the growth of exports in recent years. These findings provide theoretical and empirical support to Mr. Krugman's observations about the importance of imports.

Hummels et al. (2001) illustrated the import-export continuum with this diagram:

Figure 2: Import-Export Continuum



Source: (Hummels et al. 2001).

The "Country 1 produces an intermediate good and exports it to Country 2. Country 2 combines the imported intermediates with capital and labor (value-added), and domestically produced intermediate inputs to produce a final good (gross output). Finally, Country 2 exports some of the final good to Country 3" (Hummels et al, 2001, p. 78). Hummels et al. (2001) is widely regarded in the literature as the first instance when the link between imports and exports is quantified.

Reimer (2011) expands the knowledge of the import-export continuum by providing "the first estimates in the literature of the domestic factor content of exports, and the foreign factor content of imports" (p. 181). The import content of export data was not provided as the aggregate/cumulative figure, but instead split into two categories: labour and capital.

Overall, the concepts developed by Krugman (1993), Hummels et al. (2001), and Reimer (2011) help establish a continuum between imports and exports, and lead to an awareness of importance of imports in country's exports. The import content of export concept is

still in its early stages of utilization, only recently appearing as statistical tool in trade-related publications, such as Statistics Canada reports (see below). All together, the above three publications demonstrate the importance of imports to exports in general, and in Nova Scotia's case, the importance of imports to fish and seafood exports in the fisheries sector.

4.2 Canada's Import Content of Exports

Cameron (1999) was Statistics Canada's first publication to explicitly refer to the import content of export concept, quantifying the link between imports to exports. However, it did not further delve into the import content of exports.

The first Statistics Canada publication to extensively focus on the subject was Cameron and Cross (1999), followed by Cross (2002). Gross and Ghanem (2003) was Canada's first publication to provide the import content of exports data on the provincial level. Meanwhile, Cross and Ghanem (2005) was Statistics Canada's first import content of exports-related publication to provide estimates for the fish sector specifically. According to Cross and Ghanem (2005), fish processors, along with fruits, vegetables, and sugar processors, had "the highest import content, reflecting limitations on domestic supply" (p. 25). Finally, Canada's most recent data on the import content of export is from 2008, and provided by the Department of Foreign Affairs and International Trade (2013).

As for the Nova Scotia-based publications, the most recent publication on the import content of export is Nova Scotia Department of Economic and Rural Development and Tourism (2013). While its level of detail is not as high as other sources, it does provide figures demonstrating the importance of imports to Nova Scotia's exports, which is very useful for this report. The second most recent Nova Scotia-based publication is by APEC (2011). Using Statistics Canada's Input-Output tables, APEC (2011) estimated the import content of exports, value-added as share of GDP, and value added as share of total exports figures for Nova Scotia, the other Atlantic provinces, and Canada as a whole.

Armstrong (2011) is another recent Canada-based publication on the import content of exports, as well as other related international trade indicators.

4.3 Non-Canadian Import Content of Exports

Examples of non-Canadian publications include official publications by the United States and France. In the United States, directed by the US Congress, the National Research Council, National Academy of Sciences (NRC, 2006), produced the *Analyzing the U.S. Content of Imports and the Foreign Content of Exports*. This detailed study contains US data and a diagram linking imports to exports developed by HIY (2001). This study also identifies challenges in connection to generating the needed data. The French government published a similar document *Reinterpreting the contribution of foreign trade to growth*, which provides the import content of export data for France, supported by mathematical calculations along with describing challenges associated with collecting

and analyzing the necessary data. An alternative diagram linking imports to exports is provided (de Vallerin, 2006).

Studies on import content of export for specific countries have been published by international organizations. For example, the Organization for Economic Co-operation and Development (OECD) published studies by Germany and Netherlands statistics departments (Loschky and Ritter, 2006; Jaarsma, 2004). Both studies provide detailed statistical overview, along with discussing measurement challenges. The OECD supplied cumulative and non-country specific studies on the import content of exports. The *OECD Science, Technology and Industry Scoreboard 2011* Report contains trade data and analysis for its 29 member countries for 1995 and 2005. It finds that "Smaller economies tend to have higher shares of imports embodied in their exports" (OECD, 2011). This should be relevant for Canada, which is generally treated and regarded as an export-dependent small open economy (Srour, p. 297, 2010). Regarding fish, the Food and Agriculture Organization reported the use of imports in exports: "Many countries that are exporters of fish also import fish. This can be done to source raw material for the processing industry" (FAO, 2010a, p. 5).

4.4 Need for an improved trade statistics methodology

Canadian and non-Canadian publications have recognized the need for an improved methodology by pointing out the limitations of only publishing stand-alone export and import data and limiting analysis of trade statistics to long-existing ratios, such as Export-to-GDP ratio:

> Export-to-GDP ratio is a measure of the reliance of economies on exports. It is not, however, the most reliable measure of the contribution of exports to GDP. This is because export costs include imported material used in the production process that does not contribute to domestic income. (Byrd and Généreux, 2004, p. 4)

Similar concerns were identified by the International Monetary Fund:

> Official trade statistics are measured in gross terms, which include both intermediate inputs and final goods. Given the rising import content in exports, aggregate trade data are increasingly affected by intermediate goods trade flows that cross borders several times. (Bayoumi, 2011, p. 11)

The adequacy and reliability of linking gross export data with GDP ratios were also questioned by the European Central Bank on the grounds of higher import content of exports: "in the presence of declining domestic value-added per unit of exports, the link between export growth and overall GDP growth may be weakened" (Bunda, di Mauro, and Rüffer, 2008, p. 15). These publications call for a new trade data methodology to obtain a more accurate data, as limitations of conventional trade data methodologies have been shown not to reflect the proliferation of vertical specialization and multi-fragmented production across countries. Indeed, there is a growing literature on the need for a new trade data methodology, to take account of multi-country production processes of goods.

Other publications focus on developing improvements in methodology originally proposed by Hummels et al. (2001), to obtain more accurate import content of exports statistics. Degain and Maurer (2010), Daudin et al. (2011), and Miroudot and Yamano (2011) proposed methodologies that would take into account today's realities of global value chains and their resultant increased intra-firm and intermediate goods trade. Meng et al. (2011) and de Vries et al. (2011) made the case for factor decomposition techniques in order to improve calculations on the sector and product levels. Amador and Cabral (2009) "propose a relative measure of vertical specialization-based trade that combines information from Input-Output matrices and international trade data" (p. 268).

A similar methodology was proposed earlier by Koopman et al. (2008) for countries engaging in "significant amounts of processing exports", such as China, Mexico, and Vietnam. It involves creating a new mathematical formula that includes input-output tables as well as the "information from detailed trade statistics (which records processing and normal exports/imports separately)" (p. 26). Koopman et al. (2008) apply that methodology to China. They find variances in the import content of exports among sectors in China. Sectors requiring high-skilled labour tend to have lower domestic content in their exports in comparison to low-skill labour sectors. Also, foreign firms (or their local subsidiaries) tend to have lower share of domestic content in their exports in comparison to domestic/local firms.

The same methodology was applied to determine the import content of exports for Mexico (De La Cruz et al., 2011). Additionally, a study by the Congressional Budget Office (CBO) points out to another limitation of the input-output tables: they do not distinguish between domestically manufactured goods for export and domestically manufactured goods intended for domestic consumption. This matters in the case of China, because there are at least "two programs under which it exempts some imports from tariffs if those imports are used as inputs in the production of goods for export." Therefore, tariffs can be used as another tool for controlling for variations in the import content of exports of the same good (CBO, 2008, p. 6). Clearly, import content of exports category is becoming an important statistical tool, needed to better capture the reality of today's global trade flows.

4.5 Impact of Food Safety and Animal Health Measures on Trade

Having established a link between country's imports and exports, and the significance of value-adding activities to trade, it is important to assess how the trade is impacted by introductions of new health-related regulations. There are few, if any, peer-reviewed articles focusing on assessing the impact of introducing aquatic animal health regulations on trade (ex. import controls measures). However, there is research with a broader scope, assessing the impact of the entire Sanitary and Phyto-Sanitary Standards (SPS) and Technical Barriers to Trade (TBT) measures. These articles tend to focus on food safety, such as the Hazard Analysis and Critical Control Points (HACCP), rather than on animal health. Still, assessing the impact of SPS and TBT regulations on food exports/imports may provide an indication and conceptual basis for assessing the impact of import control measures on live/unprocessed animals.

Beghin and Li (2011) found that SPS regulations introduced by developed countries tend to impede agri-food imports from developing countries, but not from developed countries (p. 12). This is consistent with Disdier et al. (2008) indicating that SPS and TBT measures tend to have a negative impact on agri-food products trade for developing countries, but not from developed countries (p. 348). Meanwhile, while pointing out to the same trade-impeding effects, Ganslandt and Markusen (2001) also demonstrated positive outcomes from the introduction of SPS and TBT measures. They refer to an improved product quality and safety as a result of these measures, which translates into an increased consumer confidence.

Chen and Song (2010) assess the short and long-run impacts of SPS regulations on exports of a developing country, China, from the food safety prospective. They found short run impacts to be negative and long run impacts to be positive for the agri-food sector. Also, small-scale enterprises spent more on resultant compliance costs, such as building renovations, technological innovation, and purchase of testing equipment, in comparison to medium and large-scale enterprises (p. 437). Huang et al. (2011) were even more specific, assessing the impact of SPS measures on China's tea exports. Overall, they found "that China's tea exports have been significantly restricted when importing countries increase tea safety standards" (p. 11). They call for food-exporting countries to improve SPS measures and increase investments in food production and processing as a way of improving food safety and reputation.

Bao and Qiu (2010) found a negative impact of introducing TBT measures by developing countries on other developing countries. They found that TBT measures introduced by China produced trade-impeding effects on agri-food imports (p. 266). Similarly, introductions of SPS and TBT measures have been found to have trade-impeding effect on fish products specifically, negatively affecting exports by developing to developed countries (Greenhalgh, 2004, p. 3). These findings are consistent with the analysis by Kimball et al. (2005), quantifying the economic losses incurred by Mozambique, Kenya, Tanzania and Uganda between 1998-2002 as a result of EU restrictions on their fish exports. These restrictions were introduced as an emergency-response to the cholera outbreak through the SPS mechanism of the WTO. Negative and restrictive effects of aquatic animal health regulations introduced by developed countries on developing countries are also officially confirmed by FAO (FAO, 2010b, p. 3).

Caswell (2000) proposes economic approaches in determining the implementation costs of SPS-supported food safety measures, such as HACCP. This study references Caswell and Colatore (1999) assessing HACCP implementation costs for a select sample of US plants producing breaded fish products. Their results indicate willingness for US plants to adopt HACCP regulations beyond meeting the legal threshold, justified on the grounds of reduced liability and increased marketability. Overall, these studies demonstrate economic consequences and impacts of new import regulations, such as SPS and TBT, on exporting countries, in particularly, developing countries. This leads to developing and forming an understanding of economic considerations as influential factors in trade, in particularly for fish and seafood sector.

4.6 Influencing Exports and Imports of Fish Products: Economic Considerations

Several publications identify economic considerations influencing fish and seafood exports and imports. Langenkamp and Love (2002) show that Australia experienced high prevalence (nearly 50%) of fish and seafood products imports, despite being a net exporter of fish and seafood products. They stated that "the producers of many wild caught (and some farmed) species find it more profitable to export than to sell on the domestic market. On the other hand, many Australian food wholesalers find it cheaper to import than to buy or process product locally" (p.16). Other causes included absence of high cross-sectoral productivity and limited wild fish stocks, which inhibit long-term growth prospects.

Curtotti et al. (2011) observe that Australia's net exporter status changed with time; by 2010 it became a net importer of fish and seafood products, both in value and volume categories. Australia's recent fish and seafood exports tended to be of high-value, while its fishery imports were of lower value (p.7).

4.7 Impact of Currency Exchange Rates on Imported Intermediary Inputs and Prices of Fish and Seafood Exports

Curtotti et al. (2011) describe the impact of the appreciation of the Australian dollar on exports and imports. This has made exports of Australia-produced fisheries products more expensive and thus, less competitive, in overseas markets, which resulted in decline of Australia's exports. On the other hand, the Australian currency appreciation has resulted in decline of import prices, which made imports more attractive to consumers in the local market (p. 21). However, the import content of exports has been found to have a neutralizing effect on the impact of current appreciation on country's exports.

In Singapore, Abeysinghe and Yeok (1998) found that lower prices of imported intermediary inputs can offset currency appreciation-led increases in export prices. Subsequently, these findings have been generalized by the European Central Bank (ECB) and the International Monetary Fund (IMF) (Bunda et al. 2008; Bayoumi, 2011). Both the ECB and IMF refer to globalization and increased prevalence of supply chains as catalysts behind the recent increases in the import content of exports. As well, a Statistics Canada report pointed out to the mitigating effect of the import content of exports on CPI and consumer prices, "A high intensity of imports in the context of a relatively high Canadian dollar and international competition, among other things, helped to reduce prices for some consumer goods" (Chaffe, 2009, p. 14). However, similarly to ECB and IMF, Statistics Canada's findings were not also not sector specific.

The literature also sees resilience in the intermediate goods trade. According to Bems et al. (2011) during the 2008-2009 financial crises "trade in final goods fell by twice as much as trade in intermediate goods" (p. 308). This indicates that economic-driven considerations, such as changes in exchange rates of relevant currencies, behind export and import decisions, may affect the fish and seafood sector.

These studies and reports show the increased internationalization of the sector. It is thus important to take a look at international mechanisms and institutions that govern the area of aquatic animal health, and that create the framework, context, and rules for applicable and necessary regulations.

4.8 International Aquatic Animals Health Governance Structure

Brückner (2009) describes the duties and responsibilities of the World Organization for Animal Health (OIE), along with its source of legal authority and power within the international institutional framework. This includes link to the World Trade Organization (WTO)-led Agreement on Sanitary and Phytosanitary Standards (SPS). SPS empowered the OIE to serve "as the international reference organization for setting standards for the international trade in animals and animal products" (p. 142).

Thiermann (2005) focuses on inner workings of the OIE, utilized by members in decision-making for introducing and changing standards and rules. He states that countries will be able to maximize benefits of WTO membership and international trade only if they manage to achieve a full compliance with all applicable WTO and OIE rules. In the Canadian context, NAAHP was introduced as a catalyst for meeting Canada's international obligations, and maintaining Canada's market access.

Oidtmann et al. (2011) go beyond providing the institutional context by listing disease reporting initiatives, along with linking them to the biosecurity concept. Oidtmann et al. (2012) more recently examined the most recent publication on the international fish safety structures and institutions, incorporating various trade data. Ababouch (2006) focused the research on fish and fish products trade. While not directly mentioning OIE, he provided a thorough explanation of international institutional framework, including a description of the TBT agreement, and its rationale. Bokma (2006) makes a similar argument, but on the micro level, focusing on the operational side of aquatic animal health management. He provides the operational level description of the American aquatic animal health management system before switching to a more general discussion concerning the balancing act the regulatory animal health officials have to engage in. Bokma (2006) states that striving towards the safe trade of animals and animal products, based on international standards should not result in trade-hindering burdens (p. 87).

Overall, these sources point to the importance of establishing reasonable science-based technical standards, which would not result in unnecessary impediments to trade, in particular, for developing countries with a lesser technical capacity. Emphasis on science-based principles in developing aquatic animal health standards and regulatory framework is important and timely.

4.9 Aquatic Animal Health Regulatory Frameworks and Policy in Other Countries

The literature has increasingly examined the introductions and modification of aquatic animal health regulatory frameworks on national and local levels, particularly developed countries considered significant players in exports and imports of fish and seafood

products. Bernoth et al. (2008) assess Australia's aquatic animal health framework, AQUAPLAN. Australia was the first country to introduce a national/federal regulatory framework for aquatic animal health. Overall, Bernoth et al. (2008) find "that significant benefits had been delivered to the industry" (p. 73). Berthe (2010) also refers to Australia's gains in "comparative advantage, both in terms of production and trade" (p. 13) from being free of major aquatic diseases. Understanding Australia's gains from the introduction of AQUAPLAN is helpful in assessing the impact of the implementation of the import control section of NAAHP on Nova Scotia Fisheries.

More detail is provided by Gaut (2000), which notes that a significant herpesvirus outbreak (the largest known fish disease outbreak) led to creation of AQUAPLAN. It describes the outbreak of the disease, while providing some estimates of the economic impact of the disease along with resultant policy developments. Crockford et al. (2005), Daszak et al. (2000), and Whittington et al. (2005) provide estimates of impact. To date, these estimates are the only figures of this kind, providing the economic impact loss data for wild/capture-based fisheries. Another analysis focuses on the origins of the disease, but not the economic component (Berthe, 2011). Additionally, Thorpe et al. (1997) assessed the impact of Australia's responses to the herpesvirus outbreak on other industries involved in its aquatic animals sector. This study demonstrated inter-connectedness within the sector.

Meanwhile, aquatic animal health regulations and policy initiatives have also occurred in other jurisdictions, such as the European Union. Oidtmann et al. (2010) describe and assess the impact of policy changes to aquatic animal health regulations within the European Union (EU), introduced through the *European Commission Council Directive 2006/88/EC*. While the *Council Directive 2006/88/EC* only applies to aquaculture rather than wild fisheries products, it provides better understanding of the economic impact of import control measures on trade involving fish and seafood products.

4.10 Introducing Aquatic Animal Health Regulations: Economic Considerations

The literature also considers the economic catalysts and driving forces behind the introduction of aquatic animal health regulations. Philip et al. (1999) communicate the necessity of a national-level approach towards developing aquatic animal health policies, based on economic considerations. Economic and Cost Benefit Analysis (CBA) were cited as important tools, which would help determine effectiveness of the approach. In Canada, *A Business Case in Support of a National Aquatic Animal Health Program* (DFO, 2002) used qualitative and quantitative analysis techniques, and economic data, such as production losses from disease outbreaks to provide the basis for the Government of Canada framework for aquatic animal health. Le Gall (2006) articulated a rationale for public investment in aquatic animal health on economic and socio-economic reasons. Fofana and Moran (2007) added rationale for public investments in aquatic animal disease surveillance and prevention initiatives, through demonstrating cost-effectiveness of preventative measures.

Economic benefits of preventative measures were addressed in the *Aquatic Animal Health Evidence Plan 2011/12* by the UK Department for Environment, Food and Rural Affairs (Department of Food, Environment and Rural Affairs, 2011, p. 2). In the United States, Baya et al. (2005) provided best practices example of stakeholder engagement concerning introduction of aquatic animal health measures on the state level. They focused on West Virginia, which offered free inspection services to salmonid producers in 2001 and 2002, as part of stakeholder outreach efforts. This led to a high degree of stakeholder acceptance because West Virginia demonstrated the benefits of a new regulation. While not focusing on import control measures, the article highlights best practices concerning stakeholder engagement and buy-in to new aquatic animal health regulations by emphasizing prevention of disease-related economic losses from possible disease outbreaks.

Economic losses caused by the loss of market access due to an absence of a national aquatic animal health regulatory framework were cited in the *Report on General Surveillance in Pacific oysters and Manila clams in British Columbia (Fall 2006-Spring 2009)* (Canadian Food Inspection Agency, 2009). The report specified losses in the excess of million dollars from the 2003 European Union (EU) measure, effectively banning Canada's exports of molluscs to the EU (p. 8). Having concrete economic loss figures helps justify a regulatory regime.

Mumford et al. (2009) discuss mitigating economic losses from aquatic animal disease outbreaks by looking at insurance schemes from other sectors and jurisdictions. Heikkila (2011) approaches the issue from a broader perspective, through focusing on biosecurity. Conceptually, biosecurity goes beyond aquatic animal health by incorporating terrestrial animal health matters, along with environmental considerations. Heikkila (2011) reviews nearly 231 biosecurity-related studies and lists economic losses from broader biosecurity-related causes, including terrestrial animal diseases and alien species (p. 130). Drewe et al. (2011) provide best practices and recommendations, having assessed 99 articles examining 101 biosecurity-related surveillance programs, and note the importance of economic evaluation of such programs.

Some articles cite specific economic losses from disease outbreaks, including loss of market access as forms of economic consideration leading to developments in the aquatic animal health policy area. Bondad-Reantaso et al. (2005) provide the list of economic losses from aquatic disease outbreaks and national aquatic animal health policy developments. Their research is focused on aquatic animal health issues in Asia, justified on the grounds of Asia's 90% market share of aquaculture, which is also the world's fastest growing food-producing sector (p. 249). In addition to providing data on economic losses, Israngkura and Sae-Hae (2002) proposed a then new economic quantification methodology for calculating economic losses, which involves quantifying costs "at the farm level, at the national level, and via the farmer's investment decision in disease control" (p. 55). Mohan and Walker (2009) discussed determinants of success in implementing aquatic animal health regulations by stating that "International cooperation and productive alliances of governments, industry and the community will be required to

underpin the goal of profitable and environmentally sustainable aquaculture development" (p. 143).

Overall, these studies show the trends in the aquatic animal health literature. There are significantly more data and studies on aquatic animal diseases and their economic impacts for aquaculture in comparison to wild/capture fisheries. All of these studies note the importance of preventative measures in terms of their economic impact, which would inform a SWOT analysis.

4.11 Differences in the Availability of Information on the Economic Impact of Diseases in Aquaculture and Wild-based Aquatic Animals

Thrush et al. (2011) observe the differences in the availability of information on the economic impact of diseases in aquaculture and wild-based aquatic animals, which can explain the above-mentioned absence of data on economic impact of diseases for wild/capture fisheries. They note that for aquaculture, the impact of diseases tends to be described in monetary terms. However, the impact of diseases for wild-based aquatic animals tends to be described in terms of changes in population, usually reductions. Additionally, they note data collection challenges due to "the lack of reports from some regions with developing countries with significant aquaculture or fishery production" (p. 1). Insufficient technological capabilities and under-reporting were cited among possible causes for these data gaps. Still, available data for aquaculture-based economic impacts can supplement the limited availability of such data for wild-based aquatic animals.

Cawthorn (2011) examines data collection challenges pertaining to aquatic animal diseases in lobsters by noting "major challenges associated with evaluating infectious and non-infectious diseases in marine environments" (p. 71). He notes this results in fewer studies of the lobster population, despite their economic value, but attributes this to a low number of lobster diseases, in comparison to other aquatic animals. Nova Scotia is explicitly mentioned as the province where the majority of lobsters are harvested in Canada. Similar conclusion can be found in Hill (2011) which, while recognizing the economic importance of crustacean diseases, states that:

> Although numerous infections have been observed in wild crustaceans, with a few exceptions there is a paucity of evidence for outbreaks of clinical disease and mortalities in the wild and no conclusive evidence yet for disease causing significant population declines. (p. 1)

In connection to Atlantic Canada and wild salmon specifically, Gardner Pinfold (2011) informs of the significance of the Atlantic salmon to the Maritimes economy. It assessed the value of Atlantic salmon in terms of the economic impact towards the GDP and employment, and found the economic impact of the wild salmon to be close to the economic impact of aquaculture-based salmon. As well, the study communicated the importance of various intervention measures taken up by public, private, and third sectors. Gardner Pinfold (2011) quantifies the economic significance of wild Atlantic

salmon, which is very important for Nova Scotia fisheries sector, given the shortage of economic data for wild-based aquatic animals.

Overall, these sources point out to challenges related in quantification of economic data for wild-based aquatic animals. This helps provide reasons for less economic data for wild-based aquatic animals in comparison to aquaculture-based aquatic animals. However, despite less data, the certainty of economic losses due to the absence of various aquatic animal health-related regulations is effectively proven and demonstrated, which is helpful for assessing the future of the sector.

4.12 Conclusion: Drawing it Together with an Analytic Framework

The literature review examined a variety of topics relevant to answering the research question. As surprising as it may appear, there are no "smoking-gun" sources in the literature that answer the question directly. This is understandable, given that the first national aquatic animal health framework was established only in 1996. Similarly, the import content of export concept was only proposed in the literature in 2001 within the context of international trade and connection between imports and exports. Since the literature assessing the impact of import control portion of aquatic animal health regulations on trade was not available, it necessitated broadening the scope to SPS and TBT regulations. Additionally, obtaining more economic data in connection on aquatic animal diseases would help answer the research question, since prevention of economic losses from aquatic animal diseases was arguably one of the underlying and core reasons for enacting aquatic animal health regulations.

Figure 3 (see next page) sets out the conceptual framework, linking the major themes from this section, in the context of international trade flows. Additionally, Appendix E of this report contains a diagram of the international governance structure for aquatic animal health, starting from international organizations, and going all the way to the import control regulation of NAAHP.

Now that the theory and concepts guiding the report have been examined in the literature review, the next two sections will provide the key data and statistics as that the basis for a subsequent SWOT Analysis in order to assess the impact of the implementation of the import control section of NAAHP on Nova Scotia fisheries. Sections 5 and 6 will, respectively, examine Nova Scotia fisheries sector through the domestic performance and international trade lenses.

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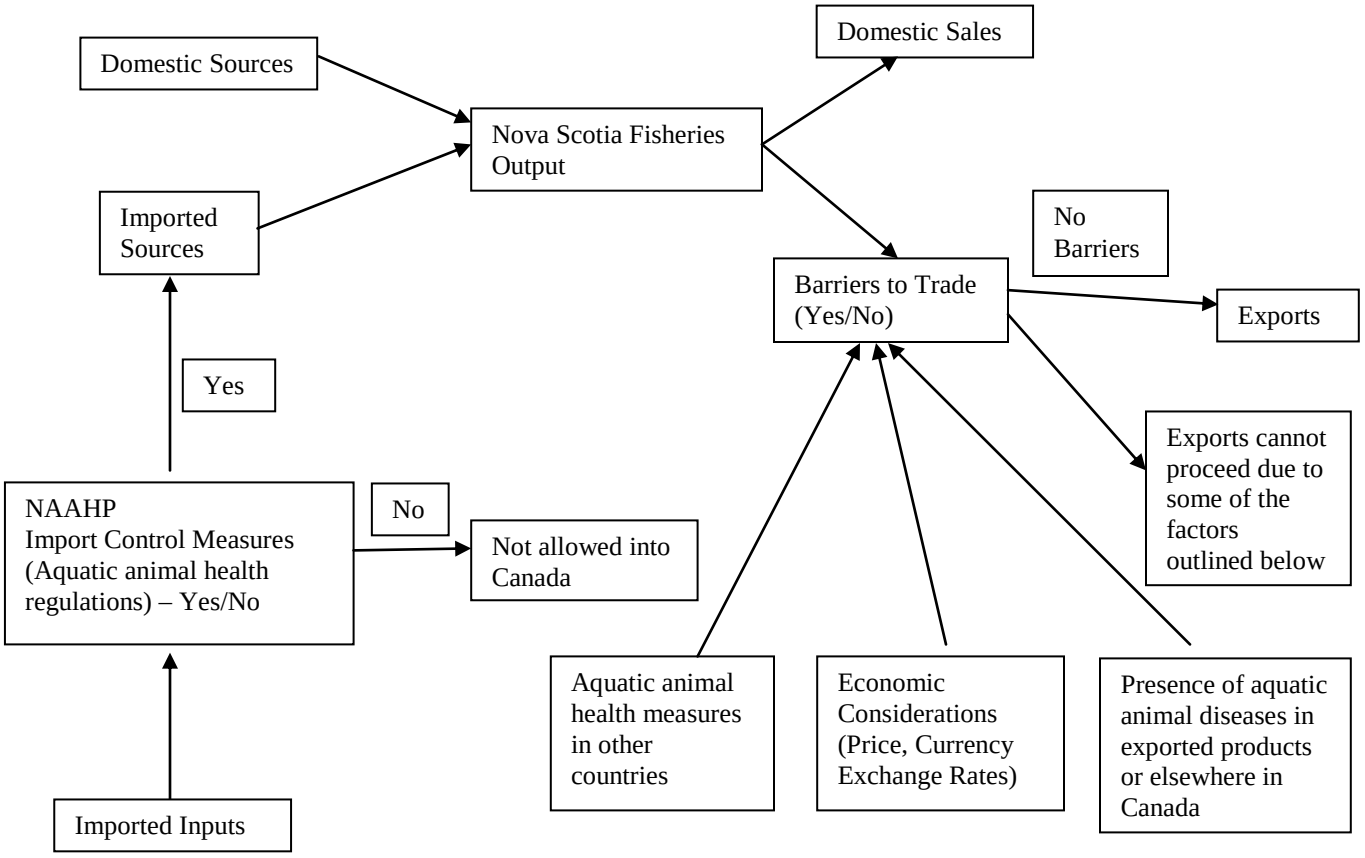
Figure 3: Conceptual Framework



5. NOVA SCOTIA FISHERIES: DOMESTIC SECTOR PROFILE

This section will inform of fisheries sector's economic performance and its significance to Nova Scotia's economy through the use of quantifiable and commonly accepted economic indicators, such as Gross Domestic Product (GDP), number of businesses, profitability, production value, and employment levels. It will largely focus only on the two fishing-related sectors in accordance with the North American Industry Classification System (NAICS): Fishing, Hunting, and Trapping (NAICS 1141 - unprocessed), and Seafood Product Packaging and Processing (NAICS 3117 - processed), because of their economic significance to Nova Scotia. As indicated in Section 1, aquaculture was not a focus of the report, rather the focus was on the Fishing, Hunting, and Trapping, and Seafood Product Packaging and Processing sectors.

5.1 Fishing, Hunting, and Trapping Sector

In this sub-section, Nova Scotia's domestic performance data for the Fishing, Hunting, and Trapping sector, consisting of wild capture fisheries-based and unprocessed products, is introduced using quantifiable economic indicators: GDP, Number of Establishments (Employer and Non-Employer), Profitability, Employment, and Value of Seafisheries Commercial Catches (by species).

Gross Domestic Product (GDP). In 2012, Nova Scotia's GDP for the Fishing, Hunting, and Trapping sector was $458.8 million.[1] [2] Newfoundland and Labrador ($252.4 million), British Columbia ($139.7 million), and New Brunswick ($128.9 million) were the runner-ups. Nova Scotia maintained the sector's highest GDP among Canada's provinces and territories since 2007 (the first available year for these statistics), when it was $335.2 million (Statistics Canada, 2013).

The $458.8 million Fishing, Hunting, and Trapping sector GDP represented 1.4% of Nova Scotia's $32.5 billion total GDP. This put Nova Scotia second among the major fishing provinces in terms of the Fishing, Hunting, and Trapping sector GDP's share of total provincial GDP. Prince Edward Island was first, with 2%%, Newfoundland and Labrador was third, with 0.97%. New Brunswick was fourth, with 0.48%, and British Columbia was fifth, with 0.07% (Statistics Canada, 2013).

Number of Establishments (Employer and Non-Employer). In 2011, Nova Scotia led all provinces and territories in the number of establishments within the Fishing, Hunting, and Trapping sector, with 2,891 establishments, accounting for 30.1% of Canada's total number of establishments within the sector.[3] That put Nova Scotia far ahead of its runner

[1] Certain data, such as GDP, is provided by Statistics Canada for the Fishing, Hunting, and Trapping sector as a whole, rather than just for the Fishing sector. "The contribution of fishing to the GDP of this category is estimated at 90% by Statistics Canada" (DFO, 2013a, p. 1).
[2] GDP is in basic prices, in chained 2007 dollars
[3] Data is taken "from Statistics Canada's Canadian Business Patterns Database which offers statistical information based on the Business Register" (Industry Canada, 2012c).

ups, British Columbia and New Brunswick, with 1,659 (17.3%) and 1,539 (16.0%) establishments, respectively (Industry Canada, 2013a).

Nova Scotia's 2,891 establishments within the Fishing, Hunting, and Trapping sector amounted to 5.4% of Nova Scotia's total number of establishments. This put Nova Scotia second among provinces in terms of the Fishing, Hunting, and Trapping sector's share of total establishments, after PEI's 10.5%. Nova Scotia was followed by Newfoundland and Labrador (4.4%), New Brunswick (3.7%), and British Columbia (0.5%) (Industry Canada, 2013b).

Nova Scotia's 2,891 establishments can be further broken down into two categories: employer and non-employer/indeterminate. In this context, employers are considered to be entities that employ individuals.[4] Non-employer establishments are defined as owner operated entities that do not employ any individuals, as "the owners do not pay wages or salaries to themselves as an employee of the company." However, "they may have work forces, which may consist of contracted workers, part-time employees, family members or business owners." Indeterminate establishment is when "the employment type of an establishment cannot be determined" (Industry Canada, 2013a, Establishment by Employment Type and Region section, para. 2).

In 2011, Nova Scotia led other provinces and territories in the number of employer establishments, with 2,011, accounting for 40% of Canada's total number of employer establishments within the Fishing, Hunting, and Trapping sector. This put Nova Scotia well ahead of its closest runner-ups, New Brunswick (1,312), and Quebec (703). However, Nova Scotia was third within the non-employer/indeterminate establishments category, with 880 establishments, behind British Columbia (1,350) and Newfoundland and Labrador (894), but ahead of Prince Edward Island (741) and New Brunswick (227) (Industry Canada, 2013a).

Nova Scotia's 2011 employers within the Fishing, Hunting, and Trapping sector accounted for 6.7% of Nova Scotia's 29,854 employers in all sectors (Industry Canada, 2013b). This put Nova Scotia first among major fishing provinces in terms of the Fishing, Hunting, and Trapping sector's share of the total number of employers. PEI was second (5.7%), New Brunswick was third (5.1%), Newfoundland and Labrador was fourth (1.4%), and British Columbia was fifth (0.2%) (Industry Canada, 2013b).

Within the employer category, Nova Scotia led other provinces and territories in the number of micro (1-4 employees) and small establishments (5-99 employees). In 2011, Nova Scotia's was home to 41% of Canada's micro establishments (1,798 out of 4,363) and 30% of Canada's small establishments (211 out of 692). New Brunswick and Quebec were close runner-ups with 1,185 and 595 micro establishments and 127 and 107 small establishments group, respectively. In terms of medium-sized establishments, Nova Scotia was second, with two establishments, behind Newfoundland and Labrador's three establishments (Industry Canada, 2013a). Nova Scotia's 1,798 micro establishments within the Fishing, Hunting, and Trapping sector represented 10.9% of all Nova Scotia's

[4] Based on data from Statistics Canada's Business Register.

micro establishments. This was first among provinces. PEI was second (10.3%), and New Brunswick was third (8.4%) (Industry Canada, 2013b).

Profitability. According to Industry Canada's SME Benchmarking Tool, in 2010, 83% of Nova Scotia's small and medium-sized businesses (with Annual Revenues $30,000 - $5,000,000) within the Fishing (NAICS 1141) sector were profitable, representing a near 10 percentage point improvement from 74% in 2008.[5] In 2010, Nova Scotia was closely behind Prince Edward Island (83.8%), and was slightly ahead of Quebec (82%), Newfoundland and Labrador (82%), and British Columbia (81%). As well, Nova Scotia led both the Atlantic Region (82%) and Canada as a whole (82%). However, Nova Scotia relatively considerably outperformed New Brunswick (77%). Nova Scotia also held similar ranking in 2008 and 2006. In 2008, Nova Scotia (74%) only trailed Quebec (75%), while barely topping New Brunswick (74%). However, Nova Scotia considerably outperformed Canada as a whole (69%), Atlantic Region (68%), British Columbia (69%), Prince Edward Island (68%), and Newfoundland and Labrador (60%). Nova Scotia also performed similarly well in 2006. Nova Scotia (73%) was trailing only Prince Edward Island (84%), and was ahead Canada as a whole (67%), Atlantic Region (67%), British Columbia (66%), New Brunswick (65%), Quebec (62%), and Newfoundland and Labrador (50%) (Industry Canada, 2013c).

Employment. Nova Scotia's 13,721 Harvesters represented 3% of Nova Scotia's 451,600 employees (total employment, seasonally adjusted) (Nova Scotia Department of Finance, 2013). In 2009, Nova Scotia led all provinces and territories in employment within the Fisheries Primary Sector (Harvesting), with 13,721, amounting to more than quarter of Canada's 50,920 employees. Newfoundland and Labrador, New Brunswick, and British Columbia were behind with 11,636, 6,159, and 6,065 employees, respectively (N. Johnson, personal communication, March 9, 2012). This was consistent with 2008, when Nova Scotia also led Canada in the Fisheries Primary Sector (Harvesting) employment, with 13,883, more than a quarter of 52,107. Same as in 2009, Nova Scotia was followed by Newfoundland and Labrador, New Brunswick, and British Columbia, with 12,365, 6,292, and 5,985. Nova Scotia's position and share within Canada was consistent from 2006-2008 (DFO, 2013a).

In 2008, Nova Scotia was first among the Atlantic provinces and Quebec in the "number of core and non-core fish harvesters" category, with 5,854 or 28% share.[6] Newfoundland and Labrador and New Brunswick were closest runner-ups with 4,903 and 3,105, respectively. At the same time, Nova Scotia was second in the number of registered fishing vessels category, with 5,269, behind Newfoundland and Labrador's 8,192 vessels (DFO, 2013a).

[5] From Statistics Canada's Small Business Profiles, "created on an industry basis using the North American Industry Classification System (NAICS)" (Industry Canada, 2013c).

[6] "A "Core enterprise" is defined as a fishing unit composed of a fish harvester (head of enterprise), registered vessel(s) and the licences he holds and which has been designated as such in 1996 under approved criteria. A "Non-Core enterprise" is defined as an enterprise which failed to meet these criteria in 1996" (DFO, 2013a).

Value of Seafisheries Commercial Catches (by species). In 2011, Nova Scotia was first among provinces and territories in value of seafisheries commercial catches, with $750 million, representing 36% of Atlantic Region and 41% of Canada's figures. This put Nova Scotia significantly ahead of its runner-ups, Newfoundland and Labrador ($647 million), British Columbia ($279 million), New Brunswick ($176 million), Quebec ($149 million), and PEI ($110 million). Nova Scotia's ranking has not changed from previous years, as it also led other provinces in the value of seafisheries commercial catches in 2010 and 2009 (DFO, 2013b).

Lobsters were the most significant species, worth $374 million, as they made up nearly half of Nova Scotia's $750 million total commercial seafisheries catches.[7] As well, Nova Scotia's lobsters made up 60% of Atlantic Canada's and Canada's total value of lobsters ($620 million). Nova Scotia's remaining top 5 species were Queen Crabs ($109 million), Scallops ($85 million), Shrimp ($54 million), and Haddock ($26 million). Altogether, Nova Scotia's top 3 catches combined for 76% and top 5 catches combined for 83% share of all seafisheries catches (DFO, 2013b).

In 2011, in addition to lobsters, Nova Scotia was also Canada's leading source of other major species (by value): scallops (90%, $84.9 million out of $94 million), haddock (99.5%, $25.9 million out of $26.1 million), herring (37.2%, $15.2 million out of $40.8 million), swordfish (98.9%, $10.5 million out of $10.6 million), and pollock (81%, $5.1 million out of $6.4 million) (DFO, 2013b).

In 2011, Nova Scotia was second among other provinces and territories in volume of commercial seafisheries catches, with 254,624 metric tonnes and 30% share of Canada's total 850,533 metric tonnes. Newfoundland and Labrador led Canada with 283,826 metric tonnes and 33% share. Lobsters make up nearly half of Nova Scotia total value of commercial seafisheries catches, only make up 15% of total volume (DFO, 2013b).

This sub-section provided the domestic performance data for the Fishing, Hunting, and Trapping sector through the use of quantifiable economic indicators, such as GDP and Number of Establishments. Overall, these figures indicated the importance of the sector to Nova Scotia, as well as the province's leading position and ranking in comparison to other provinces. For a summary of key statistics see Table 1 on the next page.

[7] Officially, there is no commercial freshwater fishing in Nova Scotia, as freshwater fishing is limited to recreational fishing only. However, "there are catadromous and anadromous species that have a freshwater life cycle phase, such as American eels and gaspereau." For statistical purposes, they are classified as marine species by DFO (personal communication, August 25, 2011).

Table 1 : Nova Scotia Fisheries Sector Profile – Domestic Statistics
Fishing, Hunting, and Trapping Sector (NAICS 1141)

Economic Indicator	**Figure**	**Total**	**Percentage of Total Figure**	**Rank (among provinces)**
GDP	$458.8 m	$32.5 billion (province)	1.4%	2nd
Number of Establishments (Out of Total Establishments within the sector in Canada)	2,891	9,594	30.1%	1st
Number of Establishments (out of Total Nova Scotia Establishments)	2,891	53,147	5.4%	2nd
Number of Employer Establishments (Out of Total Employer Establishments within the sector in Canada)	2,011	5,062	40%	1st
Number of Employer Establishments (out of Total Nova Scotia Employer Establishments)	2,011	29,854	6.7%	1st
Profitability (Percentage of profitable SMEs within the sector)	83%	Unknown	Unknown	2nd
Number of Harvesters (Out of Nova Scotia Total Employment – Seasonally Adjusted	13,721	451,600	3%	Unknown
Number of Harvesters (In comparison to other provinces within the sector)	13,721	50,920	27%	1st
Number of core and non-core fish harvesters (Among Atlantic Provinces)	5,854	17,882	28%	1st
Value of Seafisheries Commercial Catches	$750 million	$2,107,402	41%	1st
Volume of Seafisheries Commercial Catches	254,624 metric tonnes	850,533 metric tonnes	30%	2nd

Sources: Data used in this table was taken from the Department of Fisheries and Oceans (DFO, 2013a) (DFO, 2013b), Industry Canada (Industry Canada, 2013a), and Statistics Canada (Statistics Canada, 2013).

5.2 Seafood Product Processing and Packaging Sector

This sub-section contains Nova Scotia's domestic performance data for the Seafood Product Processing and Packaging sector, consisting of processed fish and seafood products. The data is brought forth through the use of quantifiable economic indicators: GDP, Number of Establishments (Employer and Non-Employer), Profitability, Employment, Production Value, Number of Licensed Seafood Processing Plants, and Narrowing Margins.

Gross Domestic Product (GDP). In 2012, Nova Scotia's Seafood Product Processing and Packaging sector's Gross Domestic Product (GDP) was $213 million.[8] [9] This made Nova Scotia third among Canada's provinces, behind Newfoundland and Labrador, with $275 million GDP and New Brunswick's $235 million figure (Statistics Canada, 2013).[10] Nova Scotia's $213 million GDP within the Seafood Product Processing and Packaging sector has accounted for 0.7% of the total provincial GDP (Statistics Canada, 2013).

Number of Establishments (employer and non-employer). In 2011, Nova Scotia led all provinces and territories in the number of establishments within the Seafood Product Preparation and Packaging sector, with 278 establishments, accounting for 31% of Canada's total number of establishments.[11] That put Nova Scotia far ahead of its runner ups, British Columbia and Newfoundland and Labrador, with 158 (17%) and 152 (17%) establishments, respectively (Industry Canada, 2013a).[12]

Nova Scotia's 278 establishments can be further broken down into two categories: employer and non-employer/indeterminate. In this context, employers are considered to be entities that employ individuals.[13] Non-employer establishments are defined as owner operated entities that do not employ any individuals, as "the owners do not pay wages or salaries to themselves as an employee of the company." However, "they may still have work forces, which may consist of contracted workers, part-time employees, family members or business owners." Indeterminate establishment is when "the employment type of an establishment cannot be determined" (Industry Canada, 2013a, Establishment by Employment Type and Region section, para. 2).

In 2011, Nova Scotia led other provinces and territories in the number of employer establishments, with 216, accounting for 35.2% of Canada's total number of employer establishments within the Seafood Packaging and Processing sector. Once again, its runner ups were far behind, with 90 (New Brunswick) and 89 (British Columbia) employer establishments, respectively. However, in terms of non-employer/indeterminate establishments, Nova Scotia was only third, with 62 establishments, behind Newfoundland and Labrador (71) and British Columbia (69) (Industry Canada, 2013d).

Nova Scotia's 278 establishments within the Seafood Packaging and Processing sector represented 0.5% of all of Nova Scotia's establishments. This tied Nova Scotia for second among the major fishing provinces within this category, with PEI. Newfoundland and Labrador was first, with 0.6%.

Within the employer category, Nova Scotia led other provinces and territories in the number of micro (1-4 employees) and small establishments (5-99 employees). In 2011,

[8] NAICS Code 3117 – Seafood Product Preparation and Packaging
[9] GDP in basic prices, in Chained 2007 dollars
[10] Applicable GDP data was not available for certain provinces, such as British Columbia, because it was "Suppressed to meet the confidentiality requirements of the Statistics Act".
[11] Data is taken "from Statistics Canada's Canadian Business Patterns Database which offers statistical information based on the Business Register" (Industry Canada, 2012e).
[12] Please refer to Appendix C. Figures are based on NAICS 3117 classification.
[13] Based on data from Statistics Canada's Business Register.

Nova Scotia's was home to 52% of Canada's micro establishments (117 out of 240) and 31% of Canada's small establishments (87 out of 284). However, in the Medium category (100-499 employees), Nova Scotia was only fourth, with 12 establishments, behind New Brunswick (27), Newfoundland and Labrador (24), and British Columbia (17). In the Large category (500+) employees, the only provinces with establishments were Newfoundland and Labrador (5), British Columbia (2), and PEI (1).

Nova Scotia also led Canada in another Number of Establishments category, Statistics Canada's Annual Survey of Manufacturers and Logging (ASML), targeting "all businesses classified as manufacturers in Canada" (Statistics Canada, 2011). In 2010 (the most recent year available), Nova Scotia accounted for nearly a third of Canada's 913 establishments and nearly a half of Atlantic Canada's 619 establishments, within the Seafood Product Preparation and Packaging Sector, with 305 establishments. That put Nova Scotia far ahead of its runner-ups, British Columbia (150), Newfoundland and Labrador (144), and New Brunswick (112). This was consistent with 2004 (the first year of the ASML), when Nova Scotia's 478 establishments also accounted for more than one third of Canada's 1,295 establishments. However, between 2004 and 2010, the number of establishments has either decreased or stayed the same for all provinces and territories. Despite maintaining its top ranking, Nova Scotia recorded the biggest decline during the period, when it lost more than 100 establishments between 2004 and 2005, seeing its count drop from 478 to 368 (Statistics Canada, 2011).

As well, Nova Scotia led Canada in the number of establishments between 2000 and 2003, under the Annual Survey of Manufactures (ASM), ASML's predecessor. ASM was different from ASML by targeting only "businesses with annual sales greater than or equal to $30,000" (Statistics Canada, 2005). In 2003, Nova Scotia's 188 establishments accounted for more than quarter of all Canada's establishments. That put Nova Scotia far ahead of its runner-ups, Newfoundland and Labrador (131), British Columbia (118), and New Brunswick (91). In 2000, Nova Scotia's 205 establishments also accounted for more than quarter of Canada's total, thereby placing it well ahead of Newfoundland and Labrador (131), British Columbia (118), and New Brunswick (91) (Statistics Canada, 2005). While the ASM methodology does not allow direct comparison with statistics obtained from the ASML, it can show Nova Scotia's position and ranking in comparison to other provinces.

Employment. In 2011, Nova Scotia had the third highest number of employees, 6,647, within the Seafood Product Preparation and Packaging Sector. New Brunswick led Canada, with 8,461 employees, followed by Newfoundland and Labrador, with 8,444. Nova Scotia's ranking did not change from 2004 (the first year of the data), when it was also third, with 6,955 employees, behind Newfoundland and Labrador (9,357) and New Brunswick (7,530) (Statistics Canada, 2011).

Profitability. According to Industry Canada's SME Benchmarking Tool, in 2010, Nova Scotia was the second most profitable province within the Seafood Product Preparation and Packaging sector, as 70% of Nova Scotia's small and medium-sized businesses (with Annual Revenues $30,000 - $5,000,000) were profitable. Nova Scotia was only trailing

Quebec's 72%, but was ahead of New Brunswick (67%), British Columbia (62%), Newfoundland and Labrador (51%), and Prince Edward Island (47%). Also, Nova Scotia was first both regionally (62%) and nationally (64%). Nova's Scotia's 2010 statistics showed improvement from 2008, when Nova Scotia was third among province, with 62%, behind New Brunswick (69%) and Newfoundland and Labrador (66%), but ahead of British Columbia (44%), and Canada as a whole (61%). In 2006, Nova Scotia (67%) was second, only trailing New Brunswick (69%), and was ahead of both British Columbia (50%) and Newfoundland and Labrador (40%), and Canada as a whole (58%) (Industry Canada, 2013c).

Production Value. In 2006, the production value of processing and packaging activities for Nova Scotia Fisheries sector was around $1.1 billion. Approximately $975 million (89%) of the value-added output was exported. This marks a decline from 1999-2005, when export output was consistently at the $1.1 billion level. Due to geographic proximity, United States is Nova Scotia's top export destination, accounting for 60% of exports. This represents a decline in the share of US-bound exports, from of 65% a decade ago. A more detailed export/import data will be provided in subsequent sections (Nova Scotia Department of Fisheries and Aquaculture, 2007a, p. 8).

Number of Licensed Seafood Processing Plants. In 2006, there were 223 licensed seafood processing plants, a drop from over 400 in the early 1990s. Out of 223 licensed plants, only 182 were operational, with 39 inactive and 2 did not provide sufficient information. Nova Scotia's 182 operational plants were classified into four major categories: processing (106); shipping lobster (41); buyers and sellers (32); and, wholesale/retail trade (2). Processing was the only category where actual processing activities, as defined by applicable regulations took place (Nova Scotia Department of Fisheries and Aquaculture, 2007, p. 12).

In this context, processing activities referred to "cleaning, filleting, icing, packing, canning, freezing, smoking, salting, cooking, pickling, drying or preparing fish for market" (Nova Scotia Department of Fisheries and Aquaculture, 2007, p. 13). In 2006, 119 plants reported shellfish as the most dominant source of sales revenues, with the most plants listing lobsters as exclusive or most dominant source of sales revenue. There were 42 plants that reported groundfish as their leading source of sales revenue. These plants are involved in "shipping fresh and frozen product mainly to the U.S., or are producing saltfish for the U.S., Caribbean and European markets" (Nova Scotia Department of Fisheries and Aquaculture, 2007, p. 14). Among them, 16 plants were involved exporting pelagic species (herring, tuna and swordfish), and 5 plants focused on salmon processing, both in fresh and smoked form.

There are two main approaches for sourcing raw materials. The first approach involves obtaining the needed raw fish and other seafood inputs from local sources. The second approach involves importing the needed raw fish and other seafood inputs from outside of Canada. Two business models for locally sourcing raw materials are utilized by Nova Scotia processors: separation of harvesting and processing activities and integration of harvesting and processing activities into company's operations. It should be noted that all

of these categories are not mutually-exclusive, as many plants employed more than one approach for sourcing raw materials.

Out of 102 plants reporting, as a result of the DFO's 1978 fleet separation policy, 70 plants do not own vessels, and thus, obtain the needed raw fish and seafood inputs from independent harvesters through various business arrangements. This resulted "in intense competition for raw material and on-going cash flow constraints", which discouraged collaboration and cooperation on policy and marketing issues (Nova Scotia Department of Fisheries and Aquaculture, 2007, p. i). Sixty out of 70 non-integrated plants reported obtaining raw materials from local sources. Only 12 plants reported dependence on imported raw fish and seafood inputs, while 8 of these plants were saltfish plants, with 20-50% share of imported inputs in final output.

The remaining 32 plants were part of businesses owning fishing vessels, which enables integration of harvesting and processing activities. They were grandfathered under the aforementioned DFO fleet separation policy. None reported obtaining raw fish and seafood materials from international sources. Also, integrated plants have shown to be the most successful (Nova Scotia Department of Fisheries and Aquaculture, 2007, p. 21).

Narrowing Margins. Nova Scotia's seafood processing sector was observed to be experiencing difficulties on both the cost and revenue sides of the equation. On the cost side, production costs were increasing due to higher raw material and operating costs. On the revenue side, increased competitive pressures from low cost producers, greater market strength of buyers and distributors, and appreciation of the Canadian dollar against the US dollar has contributed to reductions in revenues. Particular attention should be paid to decline in value of the US dollar, given the Nova Scotia's dependency on US fish and seafood exports, which despite slightly lessening from 80%-levels in 1990s, was still averaging 65-70% in recent years (see Table 2, next page).

This sub-section provided the domestic performance data for the Seafood Product Preparation and Packaging sector, which indicated sector's significance to Nova Scotia, as well as its leading ranking in comparison to other provinces.

5.3 Summary of Nova Scotia Fisheries: Domestic Sector Profile

This section put forth domestic statistics for the Nova Scotia Fisheries sector, using the commonly accepted and quantifiable economic indicators, such as GDP, Number of Establishments, and Profitability. These statistics were split by two sub-sectors, in accordance to the North American Industry Classification System: Fishing, Hunting, and Trapping (unprocessed fish and seafood products), and Seafood Product Packaging and Processing (processed fish and seafood products).

Table 2: Seafood Product Processing and Packaging Sector (NAICS 3117)

Economic Indicator	**Figure**	**Total Figure for Nova Scotia or sector**	**Percentage of Total Figure for Nova Scotia or sector**	**Rank (among provinces)**
GDP	$213 million	$32.5 billion	0.7%	Unknown
Number of Establishments[14] (Out of Total Establishments within the sector in Canada)	278	891	31%	1st
Number of Establishments[15] (out of Total Nova Scotia Establishments)	278	53,147	0.5%	2nd
Number of Employer Establishments	216	614	35.2%	1st
Number of Establishments[16]	305	913	33%	1st
Number of Employees	6,647	31,903	21%	3rd
Profitability	70%	N/A	N/A	2nd

Sources: Data taken from Industry Canada and Statistics Canada.

The data presented in this section indicated Nova Scotia Fisheries sector's significance to the province, as well as Nova Scotia's leading position in comparison to other provinces. However, these figures also showed that the Fishing, Hunting, and Trapping sub-sector is doing much better in comparison to the Seafood Product Packaging and Processing sub-sector. This section's data and findings will form one basis for the SWOT Analysis (Section 7).

[14] Statistics Canada's Business Register
[15] Statistics Canada's Business Register
[16] Statistics Canada's Annual Survey of Manufacturers and Logging (ASML)

6. NOVA SCOTIA FISHERIES: INTERNATIONAL TRADE PROFILE

This section provides the international trade data for the Nova Scotia Fisheries sector. The international trade data will be used in the SWOT Analysis in the context of determining the significance of exports and imports to Nova Scotia fisheries, which will include looking at linkages between exports and imports, using the import content of exports concept. This data will be used to assess the impact of the implementation of the import control section of NAAHP on Nova Scotia fisheries. The international trade data will be reviewed under the four categories: North American Industry Classification System (NAICS), Harmonized System (HS) Codes, Department of Fisheries and Oceans (DFO), and Import Content of Exports.

6.1 International Trade Data by the North American Industry Classification System

In this sub-section, Nova Scotia's international trade data for fish and seafood products is analyzed using the North American Industry Classification System (NAICS). Fish and seafood products are split into three NAICS classifications: Fishing (1141), Aquaculture (1125), and Seafood Product Preparation and Packaging (3117). The data comes from Industry Canada's Trade Data web-site (Industry Canada, 2013a).

Fishing. In 2012, Nova Scotia led Canada in Fishing, with 56% of total exports within the NAICS 1141 category, out of $768 million. In 2012, Nova Scotia Fishing exports were valued at $433 million. British Columbia and New Brunswick were Nova Scotia's distant runner-ups, with $175 million, and $89 million, respectively. Both Nova Scotia's and Canada's total Fishing exports declined from 2007, when they were $462 million and $818 million (Industry Canada, 2013a).

In 2012, Nova Scotia led other major fish and seafood provinces in terms of significance of Fishing exports (11%), determined by the share of Fishing exports of total provincial exports. Fishing exports made up 2.5% for Prince Edward Island (PEI), 0.60% for New Brunswick, 0.55% for British Columbia, 0.07% for Newfoundland and Labrador, and 0.02% for Quebec. Furthermore, Nova Scotia was the only province to have NAICS 1141 exports among the top 5 and only one of two provinces to have NAICS 1141 exports among the top 10 exports. Fishing exports were Nova Scotia's third biggest exports within the NAICS category, after Tire Manufacturing ($1.03 billion) and Seafood Product Preparation and Packaging ($489 million). Meanwhile, Fishing exports are 8th in PEI, 13th in Newfoundland and Labrador and outside of top 25 in British Columbia.

In 2012, Nova Scotia's Fishing imports amounted to $10 million. However, this constituted a major change from previous 10 years, when other than in 2011 ($11 million), the highest import figure was $7.8 million in 2004, with the imports steadily dropping between 2007 and 2010, from $2.4 million to $579,441. Canada's total imports within the Fishing sector were $422 million in 2012.

Nova Scotia's Canada-topping Fishing exports led to Nova Scotia's Canada-leading trade balance in the Fishing category, amounting to $423 million. This put Nova Scotia

significantly ahead of a second-place British Columbia, with a trade balance of $124.3 million. Nova Scotia consistently led Canada in trade balance within Fishing sector since 2002. Canada's overall trade balance within the Fishing category was $346 million. Therefore, it could be said that Nova Scotia's $423 trade balance figure was directly responsible for Canada's positive trade balance showing in 2012 (Industry Canada, 2013a) (see Table 3).

Table 3: Fishing (NAICS 1141)

Exports	**Share of Canada's Total Fishing Exports**	**Rank Among Other Provincial Exports**	**Significance of Exports (Percentage of Total Provincial Exports)**	**Rank of Significance of Exports (among provinces)**	**Trade Balance**	**Rank of Trade Balance among provinces**
$433 million	56%	3rd	11%	1st	$423 million	1st

Source: Industry Canada (Industry Canada, 2013a).

Seafood Product Preparation and Packaging. In 2012, Nova Scotia was third in Seafood Product Preparation and Packaging exports, with $489 million. Newfoundland and Labrador was first, with $754.4 million, New Brunswick was second, with $709 million, and British Columbia was fourth, with $452 million. Nova Scotia's Seafood Product Preparation and Packaging exports declined from 2007, when they were valued at $503 million. This was not consistent with Canada's overall performance, as total Seafood Product Preparation and Packaging exports rose from $2.7 billion in 2007 to $2.9 billion in 2012 (Industry Canada, 2013a).

However, in terms of share of Seafood Product Preparation and Packaging exports of total exports, Nova Scotia was second in 2012, at 12.8%, only behind Prince Edward Island's 16.2%. Despite being nominally eclipsed Newfoundland and Labrador and New Brunswick, Nova Scotia was ahead of both in terms of share of NAICS 3117 exports. Newfoundland and Labrador's share was 6.7% and New Brunswick's share was 4.8%. Also, Nova Scotia was ahead of British Columbia (1.4%), and Quebec (0.4%). In 2012, Seafood Product Preparation and Packaging exports were second biggest exports for Nova Scotia, New Brunswick, and Prince Edward Island, fourth largest for Newfoundland and Labrador, and 12th largest for British Columbia.

In 2012, Nova Scotia was fourth largest importer within the Seafood Product Preparation and Packaging sector, with $145 million, ahead of New Brunswick ($117 million) and Newfoundland and Labrador ($12 million). Canada's total imports were $2.2 billion. Nova Scotia's trade balance was nearly $344 million, making it the third largest in Canada. Newfoundland and Labrador was first, with $743 million, and New Brunswick was second, with $592 million. Canada's overall Trade Balance within the Seafood Product Preparation and Packaging sector was $729 million (see Table 4).

Table 4: Seafood Product Preparation and Packaging (NAICS 3117)

Exports	Share of Canada's Total Seafood Packaging Exports	Rank Among Other Provincial Exports	Significance of Exports (Percentage of Total Provincial Exports)	Rank of Significance of Exports (among provinces)	Trade Balance	Rank of Trade Balance among provinces
$489 million	17%	2nd	12.8%	2nd	$344 million	3rd

Source: Industry Canada (Industry Canada, 2013a).

Aquaculture. In 2012, Nova Scotia was fourth in Aquaculture exports, with $12 million. British Columbia led Canada with $299 million. New Brunswick was second, with $202 million, and Prince Edward Island was third, with $35 million (Industry Canada, 2013a). However, in terms of share of Aquaculture exports to total exports, Nova Scotia was fourth, with 0.3%, ahead of Newfoundland and Labrador's 0.08% share. Prince Edward Island led Canada with 4%, followed by New Brunswick (1.4%) and British Columbia (0.94%).

Aquaculture exports are sixth biggest for Prince Edward Island, ninth for New Brunswick, twelfth for Newfoundland and Labrador, eighteenth biggest for British Columbia, and outside of top 25 for Nova Scotia. In 2012, Nova Scotia was eighths among provinces in aquaculture imports, with $137,913, ahead of Prince Edward Island ($49,627) and Newfoundland and Labrador ($3,924). New Brunswick was first, with $47 million, Ontario was second, with $25 million, and British Columbia was third, with $10 million (see Table 5).

Table 5: Aquaculture (NAICS 1125)

Exports	Rank Among Other Provincial Exports	Significance of Exports (Percentage of Total Provincial Exports)	Rank of Significance of Exports (among provinces)
$12 million	4th	0.3%	4th

Source: Industry Canada (Industry Canada, 2013a).

Combined Fishing and Seafood Product Preparation and Packaging Statistics. When NAICS Fishing and Seafood Product Preparation and Packaging export statistics are combined, Nova Scotia was first among provinces in 2012, with $922.3 million. New Brunswick was second, with $797.7 million, and Newfoundland and Labrador was third, with $762.4 million. They were followed by British Columbia ($627 million), Quebec ($261.2 million), and Prince Edward Island ($162.7 million) (Industry Canada, 2013a). Combined totals for Fishing and Seafood Product Preparation and Packaging exports accounted for nearly a quarter (24.19%) of Nova Scotia's all exports, first among

provinces. Prince Edward Island was second (18.68%), and Newfoundland and Labrador was third (6.74%). For the display of key statistics mentioned above, see Table 6.

Table 6: Combined Fishing and Seafood Product Preparation and Packaging Statistics

Total Exports	Rank among provinces	Percentage of Total Provincial Exports	Rank of Percentage of Total Provincial Exports among provinces
$922.3 million	1st	24.19%	1st

Source: Industry Canada (Industry Canada, 2013a).

Combined Fishing, Seafood Product Preparation and Packaging, and Aquaculture Statistics. When NAICS Fishing, Seafood Product Preparation and Packaging, and Aquaculture export statistics are combined, Nova Scotia was second among provinces in 2012, with $934 million, only trailing New Brunswick's total $999 million figure. British Columbia and Newfoundland and Labrador rounded out the top four with $926 million and $771 million totals. Quebec and Prince Edward Island were distant fifth and sixth, with $261 million and $198 million (Industry Canada, 2013a).

Combined totals for Fishing, Seafood Product Preparation and Packaging, and Aquaculture exports accounted for quarter (24.5%) of Nova Scotia's total exports, first among provinces. Prince Edward Island was close second (22.7%). Newfoundland and Labrador (6.8%), New Brunswick (6.8%), and British Columbia (2.9%) rounded out the top 5. For the display of key statistics mentioned above, please refer to Table 7.

Table 7: Combined Fishing, Seafood Product Preparation and Packaging, and Aquaculture Statistics

Total Exports	Rank among provinces	Percentage of Total Provincial Exports	Rank of Percentage of Total Provincial Exports among provinces
$934 million	2nd	25%	1st

Source: Industry Canada (Industry Canada, 2013a).

This sub-section analyzed and presented the international trade data for Nova Scotia Fisheries, using the North American Industrial Classification System. The Fisheries sector was split into three sub-sectors: Fishing (unprocessed wild capture-based fish), Seafood Product Preparation and Packaging (processed), and Aquaculture (farm-based fish). On the whole, the data presented in this sub-section pointed to the significance of Fishing and Seafood Product Preparation and Packaging sectors to Nova Scotia, in terms of international trade figures. In particular, the Fishing sector's export statistics were in leading position in comparison to other provinces.

In addition, this sub-section also presented combined international trade data statistics of the above sub-sectors. These combined figures affirm the importance of Fisheries-related exports to Nova Scotia by showing that Fisheries-related exports account for about a quarter of Nova Scotia's total exports.

6.2 International Trade Data by HS Codes

This sub-section will assess Nova Scotia Fisheries international trade using the Harmonized System (HS) Codes system. The sector will be assessed by looking at Nova Scotia's top 25 exports, by product groups (HS4 Codes) and products (HS6 Codes).

Top 25 Exports by Product Groups (HS4 Codes). In 2012, there were five fish and seafood-related product groups among Nova Scotia's top 25 exports, using HS4 Codes. "Crustaceans - Whether In Shell Or Not, Live Fresh, Chilled Frozen Dried Salted Or In Brine; Smoked" were Nova Scotia's second highest product group export, worth $572.7 million. They were followed by "Molluscs, Whether In Shell Or Live ,Fresh, Chilled, Frozen Dried, Salted Or In Brine, Smoked Fit For" (4th, $104.5 million), "Fresh Or Chilled Fish (Excluding Fish Fillets)" (7th, $77 million), Fish (Incl. Fish Meal) - Dried, Salted, Smoked Or In Brine (15th, $48 million), and Frozen Fish (Excluding Fish Fillets) (21st, $30 million).

Table 8: Nova Scotia's Top 25 Exports, by Product Groups

Product	**Value**	**Rank**
Crustaceans - Whether In Shell Or Not, Live Fresh, Chilled Frozen Dried Salted Or In Brine; Smoked	$572.7 million	2nd
Molluscs, Whether In Shell Or Live ,Fresh, Chilled, Frozen Dried, Salted Or In Brine, Smoked Fit For	$104.5 million	4th
Fresh Or Chilled Fish (Excluding Fish Fillets)	$77.4 million	7th
Fish (Incl. Fish Meal) - Dried, Salted, Smoked Or In Brine	$47.6 million	15th
Frozen Fish (Excluding Fish Fillets)	$30.2 million	21st
Total	**$832.4 million**	
Nova Scotia Total Exports	**$3.9 billion**	
Percentage	**22%**	

Source: Industry Canada (Industry Canada, 2013b).

Top 25 Exports by Products (HS6 Codes). In 2012, there were six fish and seafood-related products among Nova Scotia's top 25 exports by products (HS6 Codes). "Other Lobsters NES – Not Frozen" was Nova Scotia's third highest exported and highest seafood exported product, worth $307 million. They were followed by "Crabs - Frozen" ($132 million) and "Cold water shrimps and prawns" ($76 million). The rest of seafood products were "Scallops – frozen, salted, dried or in brine" ($68 million), "Lobsters, (Homarus Spp) – Frozen" ($56 million), and "Scallops - Live, Fresh or Chilled" ($30 million) (Industry Canada, 2013b). In 2012, there were no fish and seafood products among Nova Scotia's top 25 imports (Industry Canada, 2013b). For the display of key statistics mentioned above, see Table 9.

Table 9: Nova Scotia Top 25 Exports, By Products

Product	**Value**	**Rank**
Other Lobsters NES – Not Frozen	$307.3 million	3rd
Crabs – Frozen	$132 million	5th
Cold water shrimps and prawns	$75.8 million	7th
Scallops – frozen, salted, dried or in brine	$67.9 million	9th
Lobsters, (Homarus Spp) – Frozen	$55.7 million	12th
Scallops - Live, Fresh or Chilled	$30.3 million	23rd
Total	**$669 million**	
Nova Scotia Total Exports	**$3.9 billion**	
Percentage	**17%**	

Source: Industry Canada (Industry Canada, 2013b).

This sub-section looked at Nova Scotia Fisheries international trade statistics from the HS Codes perspective, on products basis, rather than sectoral basis. Both HS4 and HS6 categories indicate the importance of Fisheries-related exports to Nova Scotia.

6.3 International Trade Data by DFO Statistics

Total Exports and Imports. In 2012, Nova Scotia's total fish and seafood commodities exports, from wild capture fisheries-based and aquaculture-based sources, were valued at $915.4 million, second among provinces, trailing only New Brunswick ($967.2 million). Nova Scotia has been second among provinces since 2008 (DFO, 2013c).

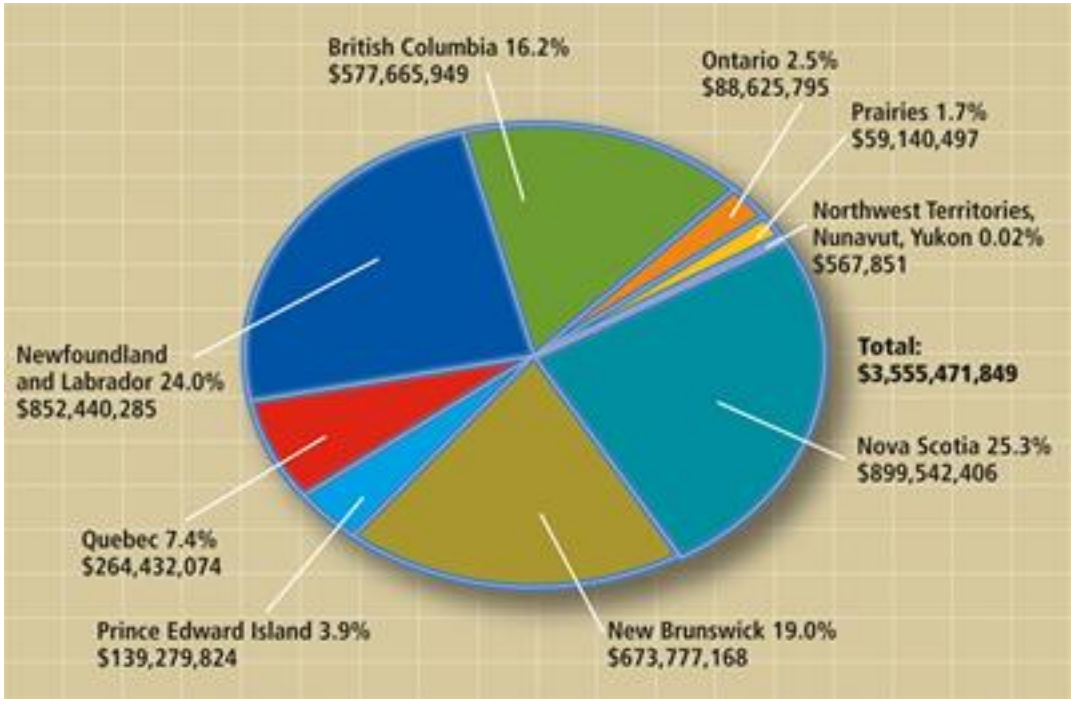
In 2012, Nova Scotia's top three fish and seafood exports, by species, were: lobsters ($374 million), Snow Queen Crabs ($101 million), and scallops ($98 million). Lobsters accounted for 41% of exports, and were mostly exported in unprocessed form. Altogether, Nova Scotia's top 3 exports accounted for 63% of all fish and seafood exports (DFO, 2013d).

In 2012, Nova Scotia's fish and seafood imports were worth $155 million, fifth in Canada. British Columbia was first, with $835 million, followed by Ontario ($810 million), Quebec ($437 million), and New Brunswick ($309 million) (DFO, 2013d).

Wild Capture-based Fisheries Exports. Nova Scotia's trade profile was significantly different when accounting only for wild capture fisheries-based exports, excluding aquaculture-based fish and seafood products. In 2011, Nova Scotia led other provinces and territories, and accounted for a quarter of Canada's wild capture fisheries exports (25.3%), amounting to $899 million. Newfoundland and Labrador and New Brunswick rounded up the top three with $852 million and $674 million, respectively, while British Columbia was fourth, with $578 million (DFO, 2012).

In 2011, Nova Scotia's share of wild capture fisheries exports out of total fish and seafood exports was 99.71%, second highest in Canada, after Quebec's 99.8% and highest among major fish and seafood provinces. Newfoundland and Labrador was closely behind, with 99.1%, followed by New Brunswick, Prince Edward Island, and British Columbia, with 80.9%, 80.84%, and 63.4% (DFO, 2012).

Below is an illustration of Canada's wild capture fisheries exports statistics.



Source: Department of Fisheries and Oceans (DFO, 2012).

Overall, in 2011, Canada's total wild capture fisheries-based exports were more than $3.5 billion, representing an increase from $3.4 billion in 2010. For more detailed information, please refer to Appendix D. For key statistics mentioned above, see Table 10 (next page).

Table 10: DFO Export/Import Statistics

Total Nova Scotia Fishing Exports (Wild Capture and Aquaculture) + Rank	**Wild Capture Exports + Rank**	**Percentage of Canada's Total Wild Capture Exports + Rank**	**Share of Wild Capture Fisheries exports out of Total Fish and Seafood Exports + Rank**
$915.4 million ($2^{nd}$)	$899.5 million ($1^{st}$)	25.3% (1^{st})	99.71% (1^{st})[17]

Source: Department of Fisheries and Oceans (DFO, 2012a).

This sub-section informed of Nova Scotia's exports and imports using the Department Fisheries and Oceans (DFO) statistics. These DFO figures differentiated between total Fisheries exports (wild capture-based fisheries and aquaculture), and wild capture-based exports. International trade data for wild capture-based fish and seafood products demonstrate3 the importance of wild capture-based fisheries to Nova Scotia.

6.4 International Trade Data by Import Content of Exports

It is important to examine the links between Nova Scotia's and Canada's exports and imports statistics. As mentioned in Sections 3 and 4, quantifying the links between exports and imports would help in assessing the preliminary impact of the import control section of NAAHP on Nova Scotia, and thus, answer the research question.

On the surface, Canada's economic indicators indicate the significance of trade, in particularly, for exports. In 2011, Canada's Exports-to-GDP ratio was 31%, represented an improvement from 29.4% in the preceding year and 28.7% in 2009 (Department of Foreign Affairs and International Trade, 2013, p. 45). However, it was still below the 2007 and 2008 levels, when it reached 35% and 35.3%, as well as below the all-time highest 45.3% in 2000. Conceptually, Canada's 2011 Exports-to-GDP figure indicated that almost one-third of Canada's domestic output is exported, and thus, indicating the importance of exports for the Canadian economy.

The latest Exports-to-GDP figure for Nova Scotia is from 2007, estimated at 21.6%, which represented a slight decline from 21.8% in 1997 (the first year available). For the period between 1997 and 2007, Nova Scotia had the highest Exports-to-GDP ratio in 2000, amounting to 26.2% (APEC, 2011, p. 98). However, Exports-to-GDP ratio is not considered to be the most reliable measure of the reliance of economies on exports. Export statistics are presented as gross figures, which include the total value of exported products and services. As a result, the value of imported intermediary inputs is included in export figures. The share of imported inputs in a product or service is conceptually called "import content of exports". Meanwhile, GDP only includes the economic value of domestic activities and processed utilized during the course of production and creation of a given product and/or service. Therefore, a more accurate measure is Value-added-

[17] First among major fish producing provinces. Second overall (after Quebec, which is not considered to be a major fish-producing province).

Exports-to-GDP ratio, which only includes the economic value of domestic production processes of the exported product/service (Byrd and Généreux, 2004, p. 4).

Canada's most recent value-added exports-to-GDP data is for 2007, estimated at 20.4%, representing a slight decrease from 21.3% in 1997, and 21.5% in 1986. The corresponding value-added exports-to-GDP figure for Nova Scotia is 12.8%, representing a slight increase from 11.5% in 1997. Nova Scotia's highest Value-added Exports-to-GDP data was 15.2% in 2000 and has been in steady decline since 2003, falling from by 2 percentage points, from 14.8% to 12.8% in 2007. Overall, the changes observed in Value-added Exports-to-GDP data for Canada and Nova Scotia are consistent with changes observed in Exports-to-GDP data, since both were at their highest in 2000 (APEC, 2011, p. 98). For key statistics mentioned above, see Table 11 just below.

Table 11: Canada Statistics

Exports-to-GDP (Aggregate)	**Value-added Exports-to-GDP (Aggregate)**	**Percentage of Value-added Exports in Fish and Seafood Sector**	**Import Content of Exports in Fish and Seafood Sector**
35%	20.4%	60%	26%

Source: APEC (APEC, 2011, p. 48).

In 2007, value-added exports made up 66.8% of all Nova Scotia's exports in the Fish, seafood, and trapping products sector, while the 61.7% corresponding figure for Canada as a whole. Meanwhile, for all industries, Canada's share of value-added exports out of total exports was 60% on the aggregate level, slightly above Nova Scotia's 59% share (D. Chaundy, personal communication, November 16, 2011).

In 2007 (the latest year available), Nova Scotia's import content of exports for Fish and Seafood products was 21.5%, a decline from 23.3% in 1997 (the first available year for the data). Between 1997 and 2007, Nova Scotia experienced highest import content of exports rate in 2000 when it climbed to 28.9%. In 2007, Nova Scotia's import content of exports for fish and seafood products was second lowest among Atlantic provinces, after Prince Edward Island, with 19.2%. The highest rate, 28.5%, was recorded in Newfoundland and Labrador, followed by New Brunswick, with 22.1%. At the same time, the import content of exports for Fish and Seafood products was 24.1% for Canada as a whole. Unlike Nova Scotia, this represented an increase from 21.1% in 1997 (D. Chaundy, personal communication, November 16, 2011). For the display of key statistics mentioned above, please refer to Table 12 (see next page).

In 2007, Nova Scotia's overall import content of export rate was 23%. This was an increase from 19% in 2003, and a decline from 26% in 1999 (APEC, 2011, p. 49) (Cross & Ghanem, 2003, p. 3.4). Comparatively, the most recent data show Canada's overall import content of exports was 26% in 2007 (APEC, 2011, p. 48). This marked decline from 28.9% in 2003, 31.1% in 1999, and 27.6% in 1986 (the first year of such data's availability). Still, Canada's 1986 figure was considered to be unusually high, and was

attributed record-level increases in auto sales driven by collapse in oil prices. This has proven to be empirically correct as it fell to 25.5% and 26.1% in the next two years.

Table 12: Nova Scotia Statistics

Exports-to-GDP (Aggregate)	**Value-added Exports-to-GDP (Aggregate)**	**Percentage of Value-added Exports**	**Import Content of Exports for Fish and Seafood Products**
21.6%	12.8%	66.8%	21.5%

Source: APEC (APEC, 2011, p. 49-55) (D. Chaundy, personal communication, November 16, 2011).

However, subsequently Canada experienced significant rise in import content of export numbers between 1989 and 1994, when they rose from 26.1% to 32.4%. This was observed in all 21 major industries. These changes were attributed to decisions by Canadian export-dependent firms to seek new ways of lowering costs. They were prompted to do so because of the appreciation of the Canadian dollar against the US currency and recession, which on average, caused profits to decline by more than 50%. Subsequently, significantly slower rise in import content of exports between 1994 and 1999 was attributed to depreciation of the Canadian currency and improved performance of the Canadian economy as a whole.

6.5 Conclusion to Nova Scotia Fisheries: International Trade Statistics

This section has provided international trade statistics for Nova Scotia using three perspectives: North American Industrial Classification System (NAICS), Harmonized System (HS) Codes, and Department of Fisheries and Oceans (DFO). The last sub-section provided data quantifying the links between imports and exports for Nova Scotia and Canada, as well as international trade-related economic indicators, along with discussion on their limitations.

The three perspectives, NAICS, HS Codes, and DFO, provided international trade data for Nova Scotia Fisheries from different angles. NAICS split the Fisheries sector into three sub-sectors: Fishing, Hunting, and Trapping, Aquaculture, and Seafood Product Preparation and Packaging. Fishing and Aquaculture covered unprocessed fish products, while Seafood Product Preparation and Packaging covered processed fish products. International trade statistics were provided on individual sub-sector and combined basis. HS Codes provided international trade data on the products-bases, by looking at Nova Scotia's top 25 exports. DFO statistics provided a further level of detail, providing international trade data for wild capture-based fisheries.

The last sub-section provides data on links between imports and exports, using the import content of exports figures. As well, it looked at economic indicators involved international trade statistics, such as Exports-to-GDP ratios, and listed their limitations.

Even though these three classifications provided different international trade data for Nova Scotia Fisheries, all of them pointed out to a common trend, centring on showing the significance of fish and seafood exports to Nova Scotia. NAICS, HS Codes, and DFO categories indicated dominant rankings for Nova Scotia Fisheries exports in terms of their share to Nova Scotia's total exports, as well as in comparison to other provinces. Along with the domestic economic data, these findings will form the basis for the next section's SWOT Analysis.

7. LOOKING TO THE FUTURE: A SWOT ANALYSIS OF NOVA SCOTIA'S FISHERIES

With the key domestic and international data for the Nova Scotia Fisheries Sector introduced, we are now in position to answer the research question: How will the import control section of NAAHP impact the Nova Scotia fisheries, in terms of trade? What follows, will use Strengths, Weaknesses, Opportunities, and Threats, and domestic and international trade statistics to assess a preliminary impact of the introduction of a regulation on a particular sector (Nova Scotia Fisheries sector, in this case). Approaching a regulation from the perspective of improving and maintaining sectoral competitiveness is superior to regarding it as an economic threat.

7.1 Strengths: Maintaining market access for Nova Scotia Fisheries exports

This sub-section will assess the preliminary impact of the implementation of the import control section of NAAHP from the perspective of the Strengths dimension of SWOT.

NAAHP was established by the Government of Canada in order to meet Canada's international obligations, as member of the World Organization for Animal Health (OIE). The Government of Canada faced with the possibility of losing the market access for Canada's fish and seafood exports, in the absence of having a federal aquatic animal health regulatory framework in place.

As indicated in the "Nova Scotia Fisheries: Domestic Profile" section (Section 5), the fisheries is a very important sector due to its contributions and share of Nova Scotia's economy. Fisheries sector's significance is shown through commonly accepted and quantifiable economic indicators, such as GDP, Number of Establishments, and Employment. Also, Nova Scotia Fisheries had dominant rankings in comparison to other provinces, as it ranked either first or second on most economic indicators. For example, in 2011, Nova Scotia's 2,891 establishments in the Fishing (unprocessed fish and seafood products) sub-sector accounted for 5.4% of all Nova Scotia's establishments, and for 30% all Fishing establishments in Canada, putting Nova Scotia first among other provinces.

Furthermore, as shown in the "Nova Scotia Fisheries: International Trade Profile" section (Section 6), fisheries exports tend to account for up to a quarter of all Nova Scotia's exports. Since approximately 90% of Nova Scotia fisheries output is exported, continuation of market access is very important to the sector and Nova Scotia as a whole. Therefore, NAAHP is vital to Nova Scotia's well-being, as it would allow Nova Scotia to maintain its dominant positions in Fisheries exports.

7.2 Weaknesses: Implications from introducing import permits

This sub-section will assess the preliminary impact of the implementation of the import control section of NAAHP from the perspective of the Weaknesses dimension of SWOT. The following two elements have been identified under this dimension:

1. The costs of import permits incurred by importers, estimated to be close to $21 million over a 10 year period (at 8% discount rate). Administrative costs of obtaining an import permit are expected to be minor, while "the cost of the measures required under the permit conditions will vary according to the measures (e.g. testing, marking animals, quarantine, etc.) and the degree to which the importer's facilities are already equipped to meet the conditions" (Government of Canada, 2010). These additional costs could be passed to consumers.

2. The challenges for Nova Scotia-based importers of aquatic animals due to developing countries' short-term and medium-term challenges in meeting NAAHP's regulatory standards. As demonstrated in the literature with regards to effects of developed countries' introduction of Sanitary and Phyto-Sanitary Standards (SPS) and Technical Barriers to Trade (TBT) measures on developing countries, this is very likely to apply in this case as well. The introduction of the import control section of NAAHP is very likely to create short-term and possibly even medium-term challenges for Nova Scotia's importers, in light of developing countries' partners' possible short-term and possibly even medium-term challenges in meeting NAAHP's requirements.

As indicated above, the Weaknesses dimension revolves around the implication of implementing the import control regulations on Nova Scotia-based importers.

7.3 Opportunities: Improved positioning and opportunities for the Fisheries sector

This sub-section will assess the impact of the implementation of the import control section of NAAHP from the perspective of the Opportunities dimension of SWOT. The following six elements have been identified under this dimension.

1. The absence of federal/national aquatic animal health regulatory framework in US. While NAAHP is currently operational in Canada, same could not be said about US. At the time of writing, the US does not have a mandatory federal/national aquatic animal regulatory framework. While the draft for the proposed national regulatory system, National Aquatic Animal Health Plan, was released by the National Aquatic Animal Health Task Force in October 2008, it is still not operational, since it is considered "a guidance document and not regulation" (NOAA Fisheries, 2011, Background section, para. 3).

2. Canada has joined the list of countries with established federal/national regulatory frameworks for aquatic animal health. This is good for Canada's international standing when it comes to aquatic animal health matters. The literature points out to an increasing prominence of SPS, TBT, and other scientific and technical measures as important factors in international trade. Therefore, existence of NAAHP will lead to fewer disruptions for Nova Scotia fisheries exports. As indicated in Section 5, Canada's Fisheries industry has already incurred economic losses due to the absence of a federal/national aquatic animal health regulatory framework. For instance, in 2003, Canadian molluscs industry lost close to $1.4 million in sales as a result of European Union's new aquatic animal health regulations that adversely affected

molluscs exports. As stated in the CFIA-produced *Report on General Surveillance in Pacific oysters and Manila clams in British Columbia (Fall 2006-Spring 2009)*, "This market loss reinforced the need for a federally led National Aquatic Animal Health Program (NAAHP) similar to that already established for terrestrial animal exports" (CFIA, 2009, p. 8).

3. The establishment of NAAHP can be lead to an improved marketability and quality for Canada's fish and seafood exports. As indicated in Section 6.0, the value of Nova Scotia's and Canada's fish and seafood imports is much lower in comparison to exports. However, the importance of import should not be underestimated because the share of imported inputs of Nova Scotia's fish and seafood exports was a little more than one fifth (21.5%). Therefore, the new control import requirements would ensure the quality and safety of Nova Scotia's imports, which would result in an improved marketability and quality of its exports.

4. The impact on the Canadian currency's appreciation on Nova Scotia's fish and seafood exports can be mitigated through the use of the imported inputs. The negative impact of the appreciation of the Canadian dollar against the US dollar on Canada's exports is widely known, as the higher value of the Canadian currency makes Canada's exports more costly for non-Canadian buyers, which in turn, makes them less competitive. However, the appreciation of the Canadian currency has the opposite impact on imports because the lower value of foreign currency makes them cheaper to obtain for Canadian importers. As shown in the case of Australia and Singapore, lower prices of imported intermediary inputs could at least partially offset currency appreciation-led increases in export prices.

5. The new regulations allow the imports of specified aquatic animal species into Canada only if they would be certified as free of diseases. In turn, this would prevent the spread of those diseases in Canada's wild-capture fisheries populations. The recent study, assessing the economic impact of the wild Atlantic Salmon at $255 million in the Eastern Canada provides an indication about economic contribution of wild capture fisheries stocks to Nova Scotia. Also, as Australia's experience demonstrates, diseased aquatic animals, if imported, could cause significant consequences for the domestic industry. Australia is the first country in the world to create a national/federal aquatic animal health regulatory framework (Office of the Chief Veterinary Officer, 2002, p. 3). Australia's AQUAPLAN was launched in 1999, following the recommendations made by the National Task Force on Imported Fish and Fish Products, calling for "the development of a strategic plan for Australian fish health issues" (Bernoth, 2002, p. 13). Establishment of AQUAPLAN came as a result of the 1995 outbreak of herpes-virus in wild pilchards stocks in Western Australia, which was estimated to cause an AUS $12 million loss to Australia's pilchard fisheries industry (Gaut, 2000, p. 54). About 10-15% of pilchard population were estimated to be wiped out by the disease (Crockford et al., 2005, p. 1). However, the actual figures may be higher due to sampling and biomass estimate errors (Bernoth, 2002, p. 6). According to Frank C.J. Berthe, the Secretary General of the Aquatic Animals Health Standards Commission, OIE, "Pilchard herpes-virus is thought to

have been introduced to Australia through the import of frozen pilchards for tuna feed" (Berthe, 2010, p. 10). Australia's dependency on aquatic imports was demonstrated in the National Task Force on Imported Fish and Fish Products Report, "about 36% of the total value of Australia's fisheries production was derived from the use of aquatic imports" in 1994-1995 (Higgins, 1996, p. 27). Another pilchard herpes virus outbreak took place in 1998-1999, and resulted in the loss of AUS $15 million to the industry (Gaut, 2000, p. 55).

6. The enhancement of statistical methodology for international trade demonstrated a much lower reliance on exports than previously assumed. This could help with designing the most effective and evidence-based policies, programs, and strategies for the Fisheries sector, as well as other sectors. As mentioned in the Literature Review (Section 4), the contribution of exports to Canada's economic output (GDP), assessed by the Exports-to-GDP ratio, is actually lower than indicated by the ratio. Exports-to-GDP ratios count the total value of the product or service, rather than only the value of what was produced in Canada. As a result, the contribution of Exports to GDP is reduced if the value of imported inputs is subtracted from the total value of the exported product. Therefore, increased focus on imports, driven by the new import control regulations, could lead to an expanded knowledge and improved understanding of the Fisheries sector by all stakeholders. That would make for a more evidence-based decision and policy making going forward.

The Opportunities arising from the enactment of NAAHP revolve around Nova Scotia's better positioning, and resultant benefits for its Fisheries sector. This includes improved marketability and quality for Nova Scotia's fish and seafood exports.

7.4 Potential threats of Non-Canadian entities adversely affecting Nova Scotia Fisheries

This sub-section will assess the impact of the implementation of the import control regulation of NAAHP from the perspective of the Threats dimension of SWOT. The following two elements have been identified under this dimension:

1. Possible short-term adjustments-related challenges for importers, in particularly, from developing countries. While the import control section of NAAHP stands to benefit Nova Scotia in the long-term, the possibility of possible short-term impacts should at least be acknowledged. The presence of the import control section of NAAHP might make importing difficult from countries with less comprehensive aquatic animal health regulatory regimes. The literature points out to challenges encountered by developing countries with adjusting to SPS and TBT measures introduced by developed countries (US, European Union, etc.). However, the gradual implementation of NAAHP demonstrates the effort and willingness of the Government of Canada not use the new regulatory framework as an unofficial trade barrier.

2. The potential loss of market access as a result of a unilateral declaration of exports ban by Canada's trading partners. The presence of the import control

> section of NAAHP and NAAHP as a whole, would serve as a buffer against unilateral declaration of bans on Nova Scotia's exports, in case of discovery of an aquatic animal disease in Canada. As the most recent outbreak of BSE showed, the impact could be quiet significant. According to Statistics Canada report, discovery of BSE in Canada in 2003, in the absence of a national terrestrial animal health regulatory framework, has resulted in $2.5 billion loss in beef (cattle and calf) exports, $2 billion loss in GDP, $5.7 billion decline in total output of the Canadian economy, $1 billion decline in labour income, and a loss of 75,000 jobs (Di Piétro & Mitura, 2004, p. 5). Also, Canada has previously incurred significant economic losses as a result of aquatic animal disease outbreaks.

This sub-section focused on the threats of dimension, focusing on potential actions of non-Canadian stakeholders which could adverse impact Nova Scotia's fisheries.

7.5 Summary: Conclusions of the SWOT Analysis

Below is the summary of the Strengths, Weaknesses, Opportunities, and Threats, in the context of assessing the impact of the implementation of the import control section of NAAHP on Nova Scotia fisheries, in terms of trade. Strengths involved maintaining Nova Scotia's dominant positions and ranking in key economic indicators, as well market access. Weaknesses centred on cost of new import permits, as well as challenges to Nova Scotia-based importers, due to potential difficulties of partners from developing countries in meeting the new requirements. Opportunities revolved around improved appeal, marketability, and quality of Nova Scotia exports. Threats revolved around actions by Non-Canadian stakeholders, resulting in adverse impact on Nova Scotia fisheries.

The next page contains a summary chart of Strengths, Weaknesses, Opportunities, and Threats dimensions as a result of implementing the import control portion of NAAHP.

Summary Chart: SWOT Analysis

Strengths	**Weaknesses**
1. Maintain Nova Scotia's dominant positions and rankings in key economic indicators relative to other sectors in the province and compared to other provinces. 2. Maintain Nova Scotia's dominant rankings for fish and seafood exports.	1. New import permits could lead to higher prices for fish and seafood products. 2. Challenges for Nova Scotia-based importers of aquatic animals due to developing countries' short-term and medium-term challenges in meeting NAAHP's regulatory standards.
Opportunities	**Threats**
1. Absence of federal/national aquatic animal health regulatory framework in US. 2. Consistent with international policy trends. NAAHP could lead to new export opportunities for Canada's fish and seafood products, especially if no NAAHP-equivalent framework in US. 3. Improved Marketability/Quality of Imported fish. Leads to improved prospects for exports due to NAAHP. 4. Mitigate the negative impact of Canadian currency's appreciation on Nova Scotia's fish and seafood exports. 5. Prevent importing of diseased aquatic animals, leading to a healthier fish population. 6. Improved statistical methods demonstrating much lower reliance on exports than assumed. Can inform design of more effective policies, programs, and strategies.	1. Possible short-term adjustment-related challenges for importers. 2. Loss of market access as a result of a unilateral declaration of exports ban by Canada's trading partners.

8. DISCUSSION: FINDINGS IN PERSPECTIVE

The report seeks to assess the impact of the implementation of the import control section of NAAHP on Nova Scotia Fisheries in terms of trade. It proceeded with literature review, developed a conceptual framework, assembled domestic and international data, and undertook a high-level SWOT analysis of the Nova Scotia Fisheries sector. This new section provides a summary of these findings, identifies major themes, and concludes by setting out the context for the Options and Recommendations section.

8.1 Summary of Findings

The literature review looked at the import content of exports concept, important for this preliminary impact assessment because it quantifiably links exports and imports. According to Hummels et al. (2001), conventional approaches and methodologies for capturing and assessing the international trade data were no longer adequate due to the ever increasing prominence of global value chains and resultant fragmented and multi-country production. As a result, they proposed new methodologies for improving international trade statistics, which included measuring the increasing use of imported inputs in exported products. This provided conceptual and empirical support to Krugman's (1993) theory of the importance of imports for the importing jurisdiction, which in turn, provided a conceptual understanding on how the new import control regulations could impact Nova Scotia's exports.

The literature on the impact of aquatic animal health regulations on trade was reviewed, but the paucity of research led to a broader search on the impact of the entire Sanitary and Phyto-Sanitary Standards (SPS) and Technical Barriers to Trade (TBT) measures on trade. The literature indicated that new SPS and TBT regulations tend to have negative effect on exports from developing countries, but not from developed countries. Literature on economic factors and considerations affecting the export and import of fish and seafood showed that currency exchange rates negatively affected exports and imports. Appreciation of Australian and Canadian currencies was found to have a negative impact on exports, but also resulted in the decline of import prices, which made imports more attractive to consumers in the local market. Moreover, lower prices of imported inputs could offset the currency appreciation-driven price increases in exports.

The literature review also looked at the international governance structure for aquatic animal health. NAAHP was introduced to fulfil Canada's international obligations to the World Organization for Animal Health (OIE). For the governance chart, please go to Appendix E. Policy developments in other jurisdictions were also reviewed. Australia is widely recognized as the first country in the world to introduce a federal/national aquatic animal heath regulatory framework, which was called AQUAPLAN. That resulted in an improved comparative advantage for its fish and seafood products.

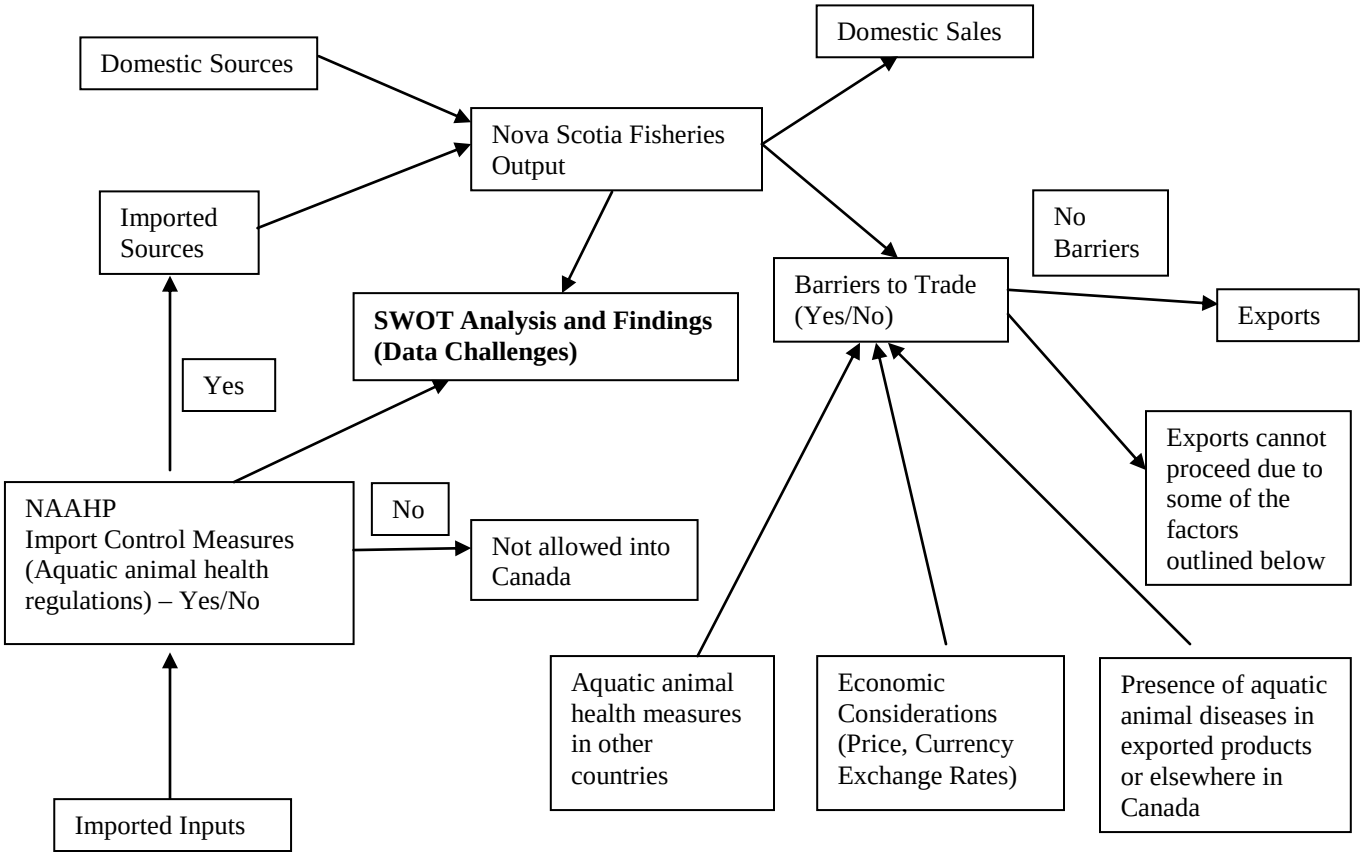
The literature review was followed by two data sections on Nova Scotia Fisheries domestic and international trade profiles. The domestic profile section provided domestic performance data using the economic indicators, such as GDP, number of businesses,

profitability, production value, and employment levels for two Fisheries sub-sectors: Fishing, Hunting, and Trapping (unprocessed and wild capture-based fish and seafood products), and Seafood Product Packaging and Processing (processed fish and seafood products). This data showed the importance of the Fisheries sector to Nova Scotia, as well as sector's leading rankings in comparison to other provinces.

The international profile section contained international trade data using three different categories: NAICS, HS Codes, and DFO. All pointed to the importance of Fisheries exports to Nova Scotia, in terms of their share of total provincial exports. The links between imports and exports for Nova Scotia and Canada were quantified (the most recent import content of exports figures were 21.5% for Nova Scotia Fisheries sector, and 24.1% for Canada's Fisheries sector), as well as international trade-related economic indicators, along with discussion on their limitations.

These findings were analyzed using the SWOT framework for an exploratory assessment of the impact of the implementation of the import control section of NAAHP on Nova Scotia Fisheries. Below is Figure 4, based on Figure 3 from section 4.12. This new figure incorporates SWOT analysis, in the context of international trade flows.

Figure 4: Conceptual Framework



8.2 Cross-cutting themes

In assessing the preliminary impact of import control section of NAAHP on Nova Scotia fisheries in terms of trade, several themes emerged: an insufficient data and information; the extent of alignment of NAAHP with Canadian interests; and the importance of the Fishing sector to Nova Scotia's economy. What follows delves into each theme in turn.

Insufficient data/information

This report was commissioned to secure more data and information. However, despite significant effort to locate literature, and the discovery of some useful data and research, it is hard not to be struck by the paucity of research. For example, no peer-reviwed academic articles were found examining the impact of aquatic animal health regulations on trade were found in the literature. It was also challenging to find specific dollar figures for estimates of economic losses, especially for wild-capture aquatic animals as a result of diseases.

The research undertaken for this report found that conventional international trade indicators, such as Exports to GDP ratio, were not as accurate and useful as previously assumed, due to the globalization-driven changes in the way the products are produced (increasingly multi-country and fragmented production). Several publications noted that while the exports-to-GDP ratios count the full value of the product, including the value of imported inputs, they lead to inflated export figures. Also, no recent import-content-of-exports statistics were available for Canada and Nova Scotia on aggregate and sectoral basis. As a result, the up-to-date international trade statistics were not available, and could not inform this analysis.

Strategic Alignment with Canadian, Nova Scotia and International interests

As a science-based regulatory program, NAAHP directly aligns with the CFIA, Canada's largest regulatory and science-based agency. Specifically, NAAHP aligns with the "safeguarding animal health" goal of CFIA, as well as with CFIA's emphasis on "collaboration with domestic and international organizations that share its objectives". As previously noted, this report is a product of a domestic collaboration involving the federal government and its provincial partners.

NAAHP also represents collaboration with international organizations, since it was established to meet Canada's international obligations. As a member of the World Organization for Animal Health (OIE), Canada was required to have a federal aquatic animal health regulatory framework in place. Otherwise, Canada stood to be at risk of losing its market access for its fish and seafood exports, in case of the emergence of aquatic animal diseases. The discovery of BSE, combined with the absence of the federal regulatory framework for terrestrial animals, led to significant losses of market access for Canadian beef exports. Thus, NAAHP was to be used as a buffer against unilateral fish and seafood export bans by Canada's trading partners.

Significance of the Fisheries sector to Nova Scotia

This report confirms the significance of fisheries to Nova Scotia. Moreover, Nova Scotia ranked first among provinces in several categories, such as wild capture fisheries-based exports and the value of seafisheries catches. It ranked first when export figures for Fishing and Seafood Product Preparation and Packaging sectors were combined.

Nova Scotia's high rankings against other provinces were reflected in the sector's significance to the province. For instance, Nova Scotia led other major fish and seafood provinces in terms of significance of fishing exports to total provincial exports. Also, for the Fishing and Seafood Processing and Packaging sectors, Nova Scotia was first in terms of these sectors' significance, accounting for close to 25% of Nova Scotia's total exports. Together, these figures indicate the importance of a prosperous and sustainable Fisheries sector to Nova Scotia.

8.3 Implications for designing options

These findings have several implications for moving forward. First, the NAAHP framework is crucial to maintaining and expanding the market access for Nova Scotia fisheries exports. Canada and other jurisdictions have lost the market access for their fish and seafood exports in light of outbreaks of aquatic animal diseases provide an indication about the consequences of not having a NAAHP-like buffer in place.

Second, as shown throughout the report, imports, despite being nominally lower than exports, are actually much more important than figures indicate. The link between imports and exports is quantified through the import content of exports concept. In 2007 (the latest year available), Nova Scotia's import content of exports for fish and seafood products was 21.5%, while value-added exports made up 66.8% of Nova Scotia fish and seafood exports. More recent Nova Scotia's statistics (for 2012), although less detailed, indicate similar state of affairs. According to the *Nova Scotia State of Trade 2012*, "the agriculture, forestry, and fishing sector exports a large share (66%) of its sector GDP but relies to a greater extent on imported inputs to produce exports (imports account for 39% of the value of exports)" (Nova Scotia Department of Economic and Rural Development and Tourism, 2013, p.47). These figures demonstrate the importance of the new import control requirement to Nova Scotia fisheries. The requirement to certify fish and seafood imports as disease-free would be a net-positive for Nova Scotia, given the prevalence of imported inputs in its fish and seafood exports.

Third, there is a critical gap between data and information available in the literature (academic and non-academic) and what is needed. Canada and Nova Scotia need more accurate and reliable statistics, and those gaps should be closed. Bridging those gaps would be consistent with the science-based practices of CFIA, Nova Scotia Departments of Agriculture, Nova Scotia Department of Fisheries and Aquaculture.

The next section provides the list of Options for moving forward. These options will be evaluated in the context of their effectiveness and feasibility for CFIA and Nova Scotia.

9. OPTIONS AND RECOMMENDATIONS

This section proposes options and recommendations for the CFIA and Nova Scotia for improving the data and analysis for a more accurate and comprehensive assessment of the Nova Scotia Fisheries sector. This would lead to a better informed decision-making and policy planning by all stakeholders. These options will be evaluated in the context of their effectiveness and feasibility for CFIA and Nova Scotia.

Option 1: Find a better way to co-ordinate existing resources

This option recommends the CFIA and the Government of Nova Scotia to improve the utilization and usefulness of existing data resources.

Data such as "import content of exports", "value-added exports", and various export/import statistics are available. For instance, Statistics Canada first published Canada's import content of exports data in 1999. However, the last year for which Statistics Canada made the import content of exports data available was 2004, and there were no publications on the subject since 2009. Likewise, while Nova Scotia's most recent publication, *Nova Scotia State of Trade 2012*, contains some import content of exports data, it was not provided at the sectoral-level of detail. The data was provided for the agriculture, forestry, and fishing sector, rather than just for the fishing sector.

Therefore, collaborative efforts to produce up-to-date report on relevant international trade and Fisheries statistics should be a priority of the senior management of CFIA and Nova Scotia officials.

In terms of feasibility, this option would not be difficult to implement because it involves utilizing the existing organizational knowledge.

On the CFIA side, the implementation of this option would involve collaboration with Statistics Canada and Department of Fisheries and Oceans. Statistics Canada would be asked to consider publishing and compiling the most recent import content of export figures, as well as other relevant international trade statistics. This would build on the existing Statistics Canada's organizational knowledge.

Option 2: Commissioning research to close the data and literature gaps

Under this option, CFIA and Nova Scotia would take steps to bridge the data and literature gaps noted in this report. For instance, there is an absence of academic articles assessing the impact of introducing federal/national aquatic animal health regulations on trade. Having academic research on the impact of aquatic animal health measures on trade for developed and developing countries, especially from the Canadian perspective, would inform more complete assessment.

This option would involve the CFIA and the Government of Nova Scotia, in collaboration with stakeholders, such as the private sector and academic community,

improve data collection methodologies to better reflect the increasing prominence of global value chains and multi-country production. Consultations with stakeholders might lead to identifying additional needs for improvement, which would allow addressing them proactively, rather than reactively.

The implementation of this option would involve collaboration with stakeholders. The academic community would be best suited to carry out the research that would bridge the data and literature gaps. Specifications of the commissioned research would be decided in consultations with stakeholders.

Option 3: Better analysis of data

This option builds on the previous two options. Better co-ordination of existing resources and improved data and statistics will provide the foundation for a more definite analysis of the current needs and realities of the fisheries industry.

CBA is a "go-to" tool for assessing the impact of regulations. However, a comprehensive CBA would only be feasible once sufficient data becomes available, which is expected to be in 2015. Enhancing data-collection and analysis capabilities would lead to a more comprehensive and industry-responsive assessment which, in turn, would lead to more informed decision making and policy planning.

Comparing Options

Table 13 (see next page) itemizes these options according to four categories: the number of annual meetings between Canadian and Nova Scotia representatives, and costs of obtaining, assembling, analyzing, vetting, and publishing the data. For Option 1, at least two meetings are expected to take place. The costs are expected to be covered through existing departmental budgets, as this option is primarily aimed at furthering operational activities, and enhancing the effectiveness and usefulness of existing resources.

Option 2 also requires at least two meetings. The costs are expected to be ongoing because the new data series would need to be developed on yearly basis.

Option 3 requires at least 3 meetings. The costs are expected to be ongoing and funded from existing budgets.

Table 14 (see p. 63) compares this report's three options using the previously stated feasibility and effectiveness criteria, as well as their benefits and costs. For Option 1, Benefits are expected to be high, as its implementation lead to a better co-ordination of existing resources. The costs are expected to be low, as they would be funded through existing budgets. However, in order to ensure continuance improvement, these co-ordination exercises would need to be carried out on ongoing basis, every 2-3 years. This option's feasibility is high because the implementation is about utilizing the existing organizational knowledge, resources, and structures. Effectiveness is medium because

even with an improved co-ordination of existing resources, the previously noted data and literature gaps would still remain.

Table 13: Itemizing options

Features	Option 1 **Coordinate Existing Data Resources**	Option 2 **Commission Research to Close Data Gap**	Option 3 **Deeper Analysis of Data (CBA)**
Number of annual meetings between Canadian and NS representatives	At least 2 meetings. First meeting will focus on what needs to be done. Second meeting will focus on progress and future steps.	At least 2 meetings. First meeting will focus on setting research parameters and specifications. Number of additional meetings is contingent upon the time it would take to implement the agreed-upon goals.	At least 3 meetings.
Costs of obtaining and assembling the data - one-time only - ongoing	Costs will be funded from existing departmental budgets on ongoing basis	Costs will be funded from existing departmental budgets on ongoing basis	Costs will be funded from existing departmental budgets on ongoing basis
Costs of analyzing the data (research) - one-time only - ongoing	Costs will be funded from existing departmental budgets on ongoing basis	Costs will be funded from existing departmental budgets on ongoing basis	Costs will be funded from existing departmental budgets on ongoing basis
Costs of vetting and publishing the data and research findings	Costs will be funded from existing departmental budgets on ongoing basis	Costs will be funded from existing departmental budgets on ongoing basis	Costs will be funded from existing departmental budgets on ongoing basis

The benefits of implementing Option 2 would be high because it would lead to filling the previously noted data and literature gaps. Costs are expected to be medium because of the costs of the commissioned deliverables. The feasibility is expected to be high because commissioning new research represents would require standard contracting procedures and within existing budgets. The effectiveness is expected to be medium-high.

The benefits of implementing Option 3 are expected to be high because its end result would be a comprehensive CBA, which would allow for a detailed and up-to-date impact assessment of NAAHP on Nova Scotia Fisheries. Costs are expected to be low because CBA is a "go-to" tool for impact assessments. The feasibility and effectiveness are also expected to be high.

Table 14: Evaluating the three options for consideration

Criteria	Option 1 **Coordinate Existing Data Resources**	Option 2 **Commission Research to Close Data Gap**	Option 3 **Better Analysis of Data (CBA)**
Benefits	High	High	High
Costs (one-time vs. ongoing data and coordination costs)	Low	Medium	Low
Feasibility	High	High	High
Effectiveness	Medium	Medium-High	High

Recommended Option: Option 3

It is recommended that CFIA and the Government of Nova Scotia first focus on Option 2 because improved data collection and bridging literature gaps would lead to a more thorough analysis practices. Implementing this option would build on Option 1, since co-ordination and use of existing resources and capabilities would be considered. Once the co-ordination of existing resources has improved and research commissioned to bridge the data and literature gaps, CFIA would be in position to carry out a comprehensive CBA. That would allow for a detailed and up-to-date impact assessment of NAAHP on Nova Scotia Fisheries, which would result in more definite answers and information for CFIA, Nova Scotia, and other stakeholders.

Organizationally, Option 3 is more useful than Options 1 and 2 because of its ultimate purpose: to equip CFIA with the most up-to-date and useful tools for conducting CBA. Option 3 is a macro-level and big picture-kind of an option, while Options 1 and 2 deal with the pieces of the puzzle as a precursor for Option 3. The implementation of Option 3 would be beneficial to CFIA, both operational and strategically, as it would enhance and strengthen CFIA's existing procedures and organizational knowledge, leading to a more informed decision making and policy planning.

The next section presents an implementation plan for Option 3.

10. IMPLEMENTATION PLAN

This section outlines a high-level implementation plan for Option 3, recommending a better analysis of data through conducting comprehensive CBA. It is set out in three phases, based on Options 1 and 2, because as stated in the previous section, Option 3 builds on Options 1 and 2.

Tasks	**Timeline**
Phase 1 – Implementation of Option 1 – Co-ordinate existing data resources	
Determine what statistics and data are needed to be published	January 2014
Meet with Statistics Canada and Department of Fisheries and Oceans colleagues and agree on deliverables	February - March 2014
Publish new report with up-to-date statistics	April - September 2014
Phase 2 – Implementation of Option 3 - Commissioning of research to close data gaps	
Consult with stakeholders about the missing and needed data and information	May 2014
Commission research reports to address those gaps	June 2014
Deadline for receiving commissioned research reports	July 2014 - June 2015
Assess the reports	July 2015-September 2015
Phase 3 – Better data analysis (CBA)	
Agree on timeline for conducting CBA	January 2014
Carry out CBA	October 2015

11. CONCLUSION

This report sought to provide an exploratory assessment of the impact of the implementation of the import control section of NAAHP on Nova Scotia fisheries in terms of trade, arising from an agreement between the federal government and the Government of Nova Scotia. As a member of OIE, Canada is required to comply with international obligations concerning aquatic animal health matters, which it did through the establishment of NAAHP.

This exploratory assessment was carried out using a mixed-method methodology, which included a review of literature, assembling and reviewing domestic and international trade data, designing an analytic framework, and undertaking a SWOT analysis. After carrying out this assessment, it was concluded that, overall, the implementation of NAAHP would be beneficial and have positive impact for Nova Scotia. Given the significance of fisheries exports to Nova Scotia, it is vital that Canada and Nova Scotia maintain the market access, which necessitates taking measures to ensure the continued market access, including establishing the NAAHP.

This report recommended CFIA and the Government of Nova Scotia to take steps to address data and literature gaps. Having an accurate, current, and industry-responsive data would lead to better-informed decision making and policy planning.

REFERENCES

Ababouch, L. (2006). Assuring fish safety and quality in international fish trade. *Marine Pollution Bulletin, 53*, 561–568. doi:10.1016/j.marpolbul.2006.08.011

Abeysinghe, T. & Yeok, T. L. (1998). Exchange rate appreciation and export competitiveness: The case of Singapore. *Applied Economics, 30, 1,* 51-55. doi:10.1080/000368498326137

Agyapong , Gloria K.Q., and Nyarku, Kwamena Minta (2011). Rediscovering SWOT Analysis: The Extended Version. Academic Leadership – The Online Journal, 9, 2. Retrieved from http://www.academicleadership.org/article/rediscovering-swot-analysis-the-extended-version

Al-Kandari, Dina, and Jukes, David J. (2011). Incorporating HACCP into national food control systems - Analyzing progress in the United Arab Emirates. *Food Control*, *22*, 851-861. doi:10.1016/j.foodcont.2010.10.013.

Amador, J, & Cabral, S. (2009). Vertical specialization across the world: A relative measure. North *American Journal of Economics and Finance, 20,* 267-280.

Armstrong, M. (2011). Adding Value to Trade Measures: An Introduction to Value-added Trade. *Conference Board of Canada*. Retrieved from http://www.conferenceboard.ca/temp/53bea518-1493-4fde-89e8-55e50e54a332/12-149_ValueAddedTrade.pdf

Atlantic Provinces Economic Council (APEC). (2011). *Taking on the World – Atlantic Canada's Role in Global Value Chains*. Retrieved from http://www.apec-econ.ca/files/docs/APEC-GVC-Report-ExecutiveSummary-Sep2011-English.pdf

Bao, X., & Qiu, L. D. (2010). Do Technical Barriers to Trade Promote or Restrict Trade? Evidence from China. *Asia-Pacific Journal of Accounting & Economics, 17,* 253–280.

Baya, A., Beback-Williams, J., M., Huang, J. C., and Semmens, K. (2005). Aquatic Animal Health Inspection in West Virginia: Pathogen Results, Producer Feedback and Service Costs. *Journal of Applied Aquaculture, 17, 3,* 103-116. doi:10.1300/J028v17n03_08

Bayoumi, T. (2011). *Changing Patterns of Global Trade.* International Monetary Fund Policy Paper. Retrieved from www.imf.org/external/np/pp/eng/2011/061511.pdf

Beghin, J.C., and Li, Y., (2011). A meta-analysis of estimates of the impact of technical barriers to trade. *Journal of Policy Modeling*, doi:10.1016/j.jpolmod.2011.11.001

Bems, R., Johnson, R. C., & Yi, K.M. (2011). Vertical Linkages and the Collapse of Global Trade. *American Economic Review, 101, 3,* 308–312. doi**:**10.1257/aer.101.3.308

Bernoth, E-M. (2002). Third progress report on the research program into mass mortalities of pilchards in southern Australian waters. CCEAD Joint pilchard scientific working group. Retrieved from http://www.daff.gov.au/__data/assets/pdf_file/0020/156341/oct02_progress_rep.pdf

Bernoth, E.-M., Ernst, I & Wright, B. (2008). National aquatic animal health plans: the Australian experience. *Rev. sci. tech. Off. int. Epiz., 27, 1,* 71-88.

Berthe, F. C. J. (2011). *Aquatic Heath Standards: commodity based approach.* OIE International Conference, Panama, 27-30 June 2011. Retrieved from www.oie.int/eng/A_aquatic/Docs/Presentations/1.4_Berthe.ppt

Berthe, F. C. J. (2010). *National Strategies on Aquatic Animal Health.* OIE Workshop for Aquatic Animal Focal Points. Retrieved from http://www.rr-middleeast.oie.int/Aquatic_training_Dubai_Sep_10/Day%202/Berthe_NationalStrategyOIErev.pdf

Bokma, B. H. (2006). Role of Import and Export Regulatory Animal Health Officials in International Control and Surveillance for Animal Diseases. *New York Academy of Sciences, 1081,* 84-89.

Bondad-Reantaso, M. G., Adlard, R., Arthur, J. R., Chinabut, S., Ogawa, K., Shariff, M., Subasinghe, R. P. & Tan, Z. (2005). Disease and health management in Asian aquaculture. *Veterinary Parasitology, 132, 249–272*. doi:10.1016/j.vetpar.2005.07.005

British Columbia Ministry of Agriculture, Food and Fisheries (2004). British Columbia Seafood Sector and Tidal Water Recreational Fishing: A Strengths, Weaknesses, Opportunities, and Threats Assessment. GSGislason & Associates Ltd. Retrieved from http://www.env.gov.bc.ca/omfd/reports/SWOT/FULL_Report.pdf

Brückner, G. K. (2009). The role of the World Organisation for Animal Health (OIE) to facilitate the international trade in animals and animal products. *Journal of Veterinary Research, 76,* 141–146

Bryson, J. M. (1988). A Strategic Planning Process for Public and Non-profit *Organizations. Long Range Planning, 21, 1,* 73-81.

Bunda, I., di Mauro, F., & Rüffer, R. (2008). *The Changing Role of the Exchange Rate in a Globalised Economy*. NO. 94. European Central Bank. Retrieved from http://www.ecb.int/pub/pdf/scpops/ecbocp94.pdf

Byrd, C., & Généreux, P. (2004). *The performance of interprovincial and international exports by province and territory since 1992.* Input-Output Division. Statistics Canada.

Retrieved from http://publications.gc.ca/collections/Collection/Statcan/11-621-M/11-621-MIE2004011.pdf

Cameron, G. (1999). Exports, GDP, and Jobs. *Perspectives. Statistics Canada, Catalogue no. 75-011-XPE*, 39-41.

Cameron, G., & Cross, P. (1999). The Importance of Exports to Jobs and GDP. *Canadian Economic Observer. Statistics Canada, Catalogue no. 11-010-XPB,* 3.1-3.5.
Canadian Food Inspection Agency (CFIA). (2013). 2012-2013 Department Review Report. In *Section I: Organizational Overview*. Retrieved from http://www.inspection.gc.ca/about-the-cfia/accountability/reports-to-parliament/2012-2013-dpr/eng/1377176926809/1377177134114?chap=2

Canadian Food Inspection Agency (CFIA). (2011). Evaluation of the National Aquatic Animal Health Program (NAAHP) at the Canadian Food Inspection Agency and the Department of Fisheries and Oceans. Retrieved from http://epe.lac-bac.gc.ca/100/206/301/cfia-acia/2011-09-21/www.inspection.gc.ca/english/agen/eval/aqua/evale.shtml

Canadian Food Inspection Agency (CFIA). (2009). *Report on General Surveillance in Pacific oysters and Manila clams in British Columbia (Fall 2006-Spring 2009).* Animal Health Directorate. Retrieved from: http://bcsga.ca/wp-content/uploads/2011/11/CFIA_ACIA-1977067-BC-Shellfish-survey-BC-Shellfish-Surveillance-Report-May-2009-en-Final-Internal-Version.pdf

Caswell, J. A. (2000). Economic approaches to measuring the significance of food safety in international trade. *International Journal of Food Microbiology, 62, 261–266.*

Caswell, J. A. & Colatore, C. (1999). The cost of HACCP implementation in the seafood industry: a case study of breaded fish. In: Unnevehr, L. (Ed.), The Economics of HACCP: New Studies of Costs and Benefits. Eagan Press, St. Paul, MN.

Cawthorn, R. J. (2011). Diseases of American lobsters (*Homarus americanus*): A review. *Journal of Invertebrate Pathology, 106, 1,* 71–78. http://dx.doi.org/10.1016/j.jip.2010.09.010

Cawthorn, R. J. (1997). Overview of "bumper car" disease—Impact on the North American lobster fishery. *International Journal for Parasitology, 27, 2,* 167–172. http://dx.doi.org/10.1016/S0020-7519(96)00146-4,

Chaffe, A. (2009). Consumer Prices: The Year 2008 in Review. *Analysis in Brief. Statistics Canada. Catalogue no. 11-621-M, 76,* 1-18.

Chen, K., & Song, H. (2010). Trade Effects and Compliance Costs of Food Safety Regulations: the Case of China [Abstract]. *Agriculture and Agricultural Science Procedia, 1,* 429–438. doi:10.1016/j.aaspro.2010.09.054

Congressional Budget Office (CBO). (2008). How Changes in the Value of the Chinese Currency Affect U.S. Imports. Publication No. 3148. Retrieved from http://www.cbo.gov/ftpdocs/95xx/doc9506/07-17-ChinaTrade.pdf

Creative & Cultural Skills. (2013). SWOT. Business survival toolkit. Retrieved from http://business-survival-toolkit.co.uk/stage-one/evaluating-the-business/swot

Crockford, M., Jones, J. B., Crane, M. S. J., and Wilcox G. E. (2005). Molecular detection of a virus, Pilchard herpesvirus, associated with epizootics in Australasian pilchards *Sardinops sagax neopilchardus. Diseases of Aquatic Organisms, 68,* 1-5.

Cross, P. (2002). Cyclical implications of the rising import content of exports. *Canadian Economic Observer. Statistics Canada. Catalogue no. 11-010-XPB, 15, 12,* 3.1-3.9.

Cross, P., & Ghanem, Z. (2005). Canada's Natural Resource Exports. *Canadian Economic Observer. Statistics Canada. Catalogue no. 11-010-XIB, 18, 5,* 20-26.

Cross, P., & Ghanem, Z. (2003). The Import Intensity of Provincial Exports. *Canadian Economic Observer. Statistics Canada, Catalogue no. 11-010-XPB, 16, 6,* 3.1 - 3.5.

Curtotti, R., George, D, Hormis, M., Mazur, K., McGill, K., Pham, T., Vieira, S., & Perks, C. (2011). Australian fisheries - outlook and economic indicators. Australian Bureau of Agricultural and Resource Economics and Sciences. Retrieved from http://adl.brs.gov.au/data/warehouse/pe_abares99001791/CP11.09_Outlook_paper_fish.pdf

de Vallerin, P. G. (2006). *Reinterpreting the contribution of foreign trade to growth.* France Ministry of the Economy, Finance and Industry. Retrieved from www.tresor.bercy.gouv.fr/TRESOR_ECO/.../2006-032-06en.pdf

de Vries, G., Foster, N., & Stehrer, R. (2011). Decomposing net trade in value added and the patterns of trade in factors. WIOD: World Input-Output Database: Construction and Applications. Retrieved from http://www.iioa.org/files/conference-2/538_20110429051_PaperDecomp_IIOA_2011-04-29.pdf

De La Cruz, Koopman, R., Wang, Z., & Wei, S-J. (2011). Estimating Foreign Value-added in Mexico's Manufacturing Exports. United States International Trade Commission. Retrieved from http://www.usitc.gov/publications/332/EC201104A.pdf

Daszak, P., Cunningham, A.A. and Hyatt, A.D. (2000) Emerging infectious diseases of wildlife – threats to biodiversity and human health. *Science, 287,* 443-449.

Daudin, G., Rifflart, C., & Schweisguth, D. (2011). Who produces for whom in the world economy? *Canadian Journal of Economics, 44, 4,* 1403-1437.

Degain, C., and Maurer, A. (2010). *Globalization and trade flows: what you see is not what you get!* World Trade Organization. Retrieved from www.wto.org/english/res_e/reser_e/ersd201012_e.pdf

Department for Environment Food and Rural Affairs. (2011). *Aquatic Animal Health Evidence Plan 2011/12*. Fish Health Inspectorate. Retrieved from http://www.defra.gov.uk/publications/files/pb13488-ep-aquatic-animal-health.pdf

Department of Fisheries and Oceans (DFO). (2013a). Fisheries and the Canadian Economy. *In Canadian Fisheries Statistics 2008.* Retrieved from http://www.dfo-mpo.gc.ca/stats/commercial/cfs/2008/section8-1-eng.htm

Department of Fisheries and Oceans (DFO). (2013b). Commercial Fisheries. Retrieved from http://www.dfo-mpo.gc.ca/stats/commercial/land-debarq/sea-maritimes/s2011pv-eng.htm

Department of Fisheries and Oceans (DFO). (2013c). Canadian Trade Exports. Retrieved from http://www.dfo-mpo.gc.ca/stats/trade-commerce/can/export/export-eng.htm

Department of Fisheries and Oceans (DFO). (2013d). Provincial and Territorial Statistics on Canada's Fish and Seafood Exports in 2012. Retrieved from http://www.dfo-mpo.gc.ca/media/back-fiche/2013/hq-ac03a-eng.htm

Department of Fisheries and Oceans (DFO). (2012). Canada's Wild Fisheries: Facts and Figures. Retrieved from http://www.dfo-mpo.gc.ca/fm-gp/sustainable-durable/fisheries-peches/stats2011/wild-sauvages-eng.htm#sum

Department of Fisheries and Oceans (DFO). (2002). *A Business Case in Support of a National Aquatic Animal Health Program*. Unpublished internal document. Office of Sustainable Aquaculture – Oceans and Aquaculture Directorate.

Department of Foreign Affairs and International Trade. (2013). *Canada's State of Trade: Trade and Investment Update 2012*. Retrieved from http://www.international.gc.ca/economist-economiste/assets/pdfs/performance/SoT_2012/SoT_2012_Eng.pdf

Di Piétro, L, & Mitura, V. (2004). Canada's beef cattle sector and the impact of BSE on farm family income. *Statistics Canada*. From: http://ageconsearch.umn.edu/bitstream/28038/1/wp040069.pdf

Disdier, A-C., Fontagne, L., & Mimouni, M. (2008). The Impact of Regulations on Agricultural Trade: Evidence From The SPS And TBT Agreements. *American Journal of Agricultural Economics, 90, 2,* 336-350. doi: 10.1111/j.1467-8276.2007.01127.x

Drewe, J. A., Hoinville, J., Cook, J. C., Floyd, T., and Stark, K. D. C. (2011). REVIEW ARTICLE - Evaluation of animal and public health surveillance systems: a systematic review. *Epidemiology & Infection*, 1-16. doi:10.1017/S0950268811002160.

FAO, 2010a. Food and Agriculture Organization of the United Nations. (2010). Fish Trade and Food Security. Twelfth Session. Committee on Fisheries. Retrieved from http://www.fao.org/docrep/meeting/018/k7354e.pdf

FAO, 2010b. Food and Agriculture Organization of the United Nations. (2010). Review of Market Access Requirements. Twelfth Session. Committee on Fisheries. Retrieved from http://www.fao.org/docrep/meeting/018/k7405e.pdf

Fofana, A. & Moran, D. (2007). An economic evaluation of the control of three notifiable fish diseases in the United Kingdom. *Preventive Veterinary Medicine, 80* 193–208. doi:10.1016/j.prevetmed.2007.02.009

Friesner, T. (2011). *History of SWOT Analysis.* Retrieved from http://www.marketingteacher.com/swot/history-of-swot.html

Ganslandt, M. & Markusen, J. R. (2001). *Standards and related regulations in international trade: A modeling approach*. NBER Working Papers 8346. Retrieved from http://www.nber.org/papers/w8346.pdf

Gardner Pinfold. (2011). Economic Value of Wild Atlantic Salmon. Atlantic Salmon Federation. Retrieved from http://0101.nccdn.net/1_5/13f/2a0/0fe/value-wild-salmon-final.pdf

Gaut, A.C. (2000). *Final Report - 1999/227 - Pilchard mortality events in Australia and related world events*. Fisheries Research and Development Corporation. Retrieved from http://frdc.com.au/research/Documents/Final_reports/1999-227-DLD.pdf

Gilabert, P., Sarter, G., and Sarter, S. (2010). A Swot analysis of HACCP implementation in Madagascar. *Food Control, 10,* 253–259. doi:10.1016/j.foodcont.2009.05.015

Global Trade Atlas. 2012. *Canada Export to World (Transport Mode: All Modes) Via Province: All Provinces Commodity: 0305, Fish, Dried, Salted Or In Brine; Smoked Fish; Fish Meal Fit For Human Consumption* [Data file]. Retrieved from http://www.gtis.com/gta/

Government of Canada (2011). *Regulations Amending the Reportable Diseases Regulations.* Canada Gazette, 145, 1. Retrieved from http://www.gazette.gc.ca/rp-pr/p2/2011/2011-01-05/html/sor-dors310-eng.html

Government of Canada (2010). *Regulations Amending the Health of Animals Regulations*. Canada Gazette, 144, 26. Retrieved from http://www.gazette.gc.ca/rp-pr/p2/2010/2010-12-22/html/sor-dors296-eng.html

Government of Canada (2009). *Regulations Amending the Health of Animals Regulations*. Canada Gazette, 143, 51. Retrieved from http://www.gazette.gc.ca/rp-pr/p1/2009/2009-12-19/html/reg1-eng.html

Greenhalgh, P. (2004). *Trade Issues Background Paper: Sanitary and Phyto-Sanitary (SPS) Measures and Technical Barriers to Trade (TBT).* Food and Agriculture Organization (FAO). Retrieved from http://www.nri.org/projects/fishtrade/issues-sanitary.pdf

Harris, F. H., McGuigan, J. R., & Moyer, C. R. (1999). *Managerial Economics: Applications, Strategy, and Tactics*. Cincinnati, Ohio, US: International Thomson Publishing.

Heikkila, J. (2011). Economics of biosecurity across levels of decision-making: a review. *Agronomy for Sustainable Development, 31,* 119-138. DOI: 10.1051/agro/2010003

Higgins, R. A. (1996). Report of the National Task Force on Imported Fish and Fish Products. Australian Government Department of Primary Industries and Energy, Canberra.

Hill, B. (2011). Foreword. *Journal of Invertebrate Pathology, 106, 1,* 1. http://dx.doi.org/10.1016/j.jip.2010.12.013,

Huang, J., Yang, J., & Wei, G. (2011). The impacts of food safety standards on China's tea exports. *China Economic Review*, 1-12. doi:10.1016/j.chieco.2011.11.002

Hummels, D, Ishii, J, & Yi, K-M. (2001). The Nature and Growth of Vertical Specialization in World Trade. *Journal of International Economics, 54, 1, 75-96*. http://dx.doi.org/10.1016/S0022-1996(00)00093-3

Idaho State University (ISU). 2006. Academic Affairs - SWOT Analysis Resource Page. Retrieved from http://www.isu.edu/acadaff/swot/index.shtml

Industry Canada. (2013a). Establishments: Fishing, Hunting and Trapping (NAICS 114). *In Canadian Industry Statistics (CIS).* Retrieved from http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis-sic114etbe.html#est1

Industry Canada. (2013b). Canadian Trade By Product (HS Codes). *In Trade Data Online*. Retrieved from http://www.ic.gc.ca/eic/site/tdo-dcd.nsf/eng/h_00006.html

Industry Canada. (2013c). SME Benchmarking Tool. *In Business Tools and Resources*. Retrieved from http://www.ic.gc.ca/eic/site/pp-pp.nsf/eng/home

Industry Canada. (2013d). Seafood Product Preparation and Packaging (NAICS 3117). *In Canadian Industry Statistics*. Retrieved from http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis-sic3117etbe.html

Israngkura, A., & Sae-Hae, S. (2002). A review of economic impacts of aquatic animal disease. In: Arthur JR, Phillips MJ, Subasinghe RP, Reantaso MB, McCrae IH (eds) *Primary Aquatic Animal Health Care in Rural, Small-scale Aquaculture Development*.

Technical Proceedings of the Asia Regional Scoping Workshop. FAO Fisheries Technical Paper 406. Dhaka, Bangladesh, pp. 55–61. Food and Agriculture Organization of the United Nations, Rome. Retrieved from http://www.fao.org/docrep/005/y3610e/y3610E25.htm

Jaarsma, M. (2004). Globalization indicators - The Import Content Of Export: The Case of the Netherlands. *Statistics Netherlands*. Retrieved from *www.oecd.org/dataoecd/9/41/31778712.ppt*

Kimball, A.M., Taneda, K, & Wong, K.-Y. (2005). An evidence base for international health regulations: quantitative measurement of the impacts of epidemic disease on international trade. *Rev. sci. tech. Off. int. Epiz., 24, 3,* 825-832.

Koopman, R., Wang, Z., & Wei, S-J. (2008). *How much of Chinese exports is really made in China? Assessing foreign and domestic value-added in gross exports.* United States International Trade Commission. Retrieved from www.usitc.gov/publications/332/working.../ec200803b_revised.pdf

Krugman, P. R. (1993). What Do Undergrads Need to Know About Trade? *The American Economic Review, 83, 2,* 23 -26.

Langenkamp, D., & Love, G. (2002). *Import Competitiveness of Australian Aquaculture*, ABARE Report to the Fisheries Resources Research Fund, Canberra, Australia. Retrieved from http://adl.brs.gov.au/data/warehouse/pe_abarebrs99000844/PC12406.pdf

Le Gall, F. G. (2006). *Economic and Social Justification of Investment in Animal Health and Zoonoses*. 74th General Session of the World Organisation for Animal Health (OIE) International Committee, Paris, May, 2006.

Loschky, A.,& Ritter, L. (2006). *Import Content of Exports.* OECD. Retrieved from http://www.oecd.org/dataoecd/60/7/37342897.pdf

Meng, B., Webb, C., & Yamano, N. (2011). *Application of Factor Decomposition Techniques to Vertical Specialization Measurements.* Institute of Developing Economies. Retrieved from https://ir.ide.go.jp/dspace/bitstream/2344/942/1/ARRIDE_Discussion_No.276_meng.pdf

Miroudot, S., & Yamano, N. (2011). *Towards measuring trade in value-added and other indicators of global value chains: Current OECD work using I/O tables*. OECD. Retrieved from http://siteresources.worldbank.org/INTRANETTRADE/Resources/Internal-Training/287823-1256848879189/6526508-1283456658475/7370147-1308070299728/7997263-1308070330438/PRESENTATION_Miroudot_Yamano.pdf

Mohan, C.V., & Walker, P.J. (2009). Viral disease emergence in shrimp aquaculture: origins, impact and the effectiveness of health management strategies. *Reviews in Aquaculture, 1*, 125–154. doi: 10.1111/j.1753-5131.2009.01007.x

Mumford, J. D., Leach, A. W., Levontin, P., and Kell, L. T. (2009). Insurance mechanisms to mediate economic risks in marine fisheries. *International Council for the Exploration Journal of Marine Science, 66*, 950–959. doi:10.1093/icesjms/fsp100

National Oceanic and Atmospheric Administration (NOAA) Fisheries (2011). National Aquatic Animal Health Plan. National Oceanic and Atmospheric Administration. Retrieved from http://www.nmfs.noaa.gov/aquaculture/supplemental_pages/naahp.html

National Research Council (NRC). (2006). *Analyzing the U.S. content of imports and the foreign content of exports.* Committee on Analyzing the U.S. Content of Imports and the Foreign Content of Exports. Center for Economic, Governance, and International Studies, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press. Retrieved from http://www.nap.edu/catalog.php?record_id=11612

Nova Scotia Department of Agriculture. (2013). About Us. Retrieved from http://www.novascotia.ca/agri/about-us/

Nova Scotia Department of Economic and Rural Development and Tourism. (2013). Nova Scotia State of Trade 2012. Retrieved from http://novascotia.ca/econ/publications/Nova%20Scotia%202012%20State%20of%20Trade-11272013.pdf

Nova Scotia Department of Finance. (2013). *Nova Scotia Statistics*. Retrieved from http://www.gov.ns.ca/finance/statistics/analysis/default.asp?id=1&sid=5

Nova Scotia Department of Fisheries and Aquaculture. (2013). *About Us*. Retrieved from http://novascotia.ca/fish/about-us/

Nova Scotia Department of Fisheries and Aquaculture. (2011). *Draft Market Assessment*. Unpublished internal document. Nova Scotia Department of Fisheries and Aquaculture

Nova Scotia Department of Fisheries and Aquaculture. (2007). *Nova Scotia Seafood Processing Sector: State of the industry and competitiveness assessment*. Gardner Pinfold. Retrieved from http://www.gov.ns.ca/fish/marketing/reports/seafoodreport.pdf

OECD (2011), *OECD Science, Technology and Industry Scoreboard 2011*, OECD Publishing. doi: 10.1787/sti_scoreboard-2011-en. Retrieved from http://www.oecd-ilibrary.org/docserver/download/fulltext/9211041ec061.pdf?expires=1326922551&id=id&accname=guest&checksum=CC7378749756575F375C630267F61B1F

Office of the Chief Veterinary Officer (2002). *AQUAPLAN: A Five-Year Review - Developments in national aquatic animal health management in Australia 1997-2002.* Agriculture, Fisheries and Forestry – Australia. Retrieved from http://www.daff.gov.au/__data/assets/pdf_file/0009/155961/aquaplan_review.pdf

Oidtmann, B., Johnston, C., Klotins, K., Mylrea, G., Van, P. T., Cabot, S., Martin, P. R., Ababouch, L. and Berthe, F. (2012). Assessment of the Safety of Aquatic Animal Commodities for International Trade: The OIE Aquatic Animal Health Code. Transboundary and Emerging Diseases. doi: 10.1111/j.1865-1682.2012.01315.x

Oidtmann, B.C., Denham, K.L, Peeler, E.J., & Thrush, M.A. (2011). International and national biosecurity strategies in aquatic animal health. *Aquaculture, 320, 1,* 22–33. doi:10.1016/j.aquaculture.2011.07.032.

Oidtmann, B.C., Peeler, E.J., Scott, A., & Stentiford, G.D. (2010). Crustacean diseases in European legislation: Implications for importing and exporting nations. *Aquaculture, 306,* 27–34. doi:10.1016/j.aquaculture.2010.06.004.

Philip, P., Ramsay, G.C., & Riethmuller, P. (1999). The economic implications of animal diseases and disease control at the national level. *Rev. sci. tech. Off. int. Epiz.,18, 2, 343-356.*

Reimer, J. J. (2011). The domestic content of imports and the foreign content of exports. *International Review of Economics and Finance, 20, 2,* 173-184. http://dx.doi.org/10.1016/j.iref.2010.11.006

Srour, G. (2010). Monetary Policy in a Small Open Economy. Bank of Canada. Retrieved from http://www.bankofcanada.ca/wp-content/uploads/2010/08/Srour-final.pdf

Statistics Canada. (2013). Gross domestic product (GDP) at basic prices, by North American Industry Classification System (NAICS) and province. (Table number 379-0030). Retrieved from http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=3790030&pattern=Gross+domestic+product+%28GDP%29+at+basic+prices%2C+by+North+American+Industry+Classification+System+%28NAICS%29&tabMode=dataTable&srchLan=-1&p1=1&p2=-1

Statistics Canada. (2011). Principal statistics for manufacturing industries, by North American Industry Classification System (NAICS). (Table number 301-0006). Retrieved from http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=3010006&paSer=&pattern=&stByVal=2&p1=-1&p2=-1&tabMode=dataTable&csid=

Statistics Canada. (2005). Annual survey of manufactures (ASM), principal statistics by North American Industry Classification System (NAICS), incorporated businesses with employees having sales of manufactured goods greater than or equal to $30,000.

(Table 301-0003). Retrieved from http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=3010003&paSer=&pattern=&stByVal=2&p1=-1&p2=-1&tabMode=dataTable&csid=

Thakur, S. (2010). *History of the SWOT Analysis. Bright Hub: The Hub for Bright Ideas.* Retrieved from http://www.brighthub.com/office/project-management/articles/99629.aspx

Thiermann, A. B. (2005). Globalization, international trade and animal health: the new roles of OIE. *Preventive Veterinary Medicine, 67,* 101–108. doi:10.1016/j.prevetmed.2004.11.009.

Thrush, M. A., Dunn, P. L. and Peeler, E. J. (2011), Monitoring Emerging Diseases of Fish and Shellfish Using Electronic Sources. Transboundary and Emerging Diseases. doi: 10.1111/j.1865-1682.2011.01283.x

Whittington, R.J., Jones, J.B., and Hyatt, A. D. (2005). Pilchard herpesvirus in Australia 1995-1999. *In* P. Walker, R. Lester and M.G. Bondad-Reantaso (eds). Diseases in Asian Aquaculture V, pp. 137-140. Fish Health Section, Asian Fisheries Society, Manila.

APPENDICES

Appendix A – History and Uses of SWOT

There is no uniform agreement on the origins and creation of SWOT (Friesner, 2011). However, the research conducted by Albert Humphrey's Team Action Model (TAM) during the 1960s at the Stanford Research Institute, is often given credit for developing the SWOT analysis tool. It was carried out on behalf of Fortune 500 companies which provided funding and data. Humphrey sought to find out "why corporate planning in terms of long-range planning was not working, did not pay off, and was an expensive investment in futility," with the end-goal of finding a solution (ISU, 2006). This resulted in the SOFT (Satisfactory - What is good in the present, Opportunities – What is expected to be good in the future, Faults – What is bad in the present, and Threats – What is expected to be bad in the future) analysis model, considered to the predecessor to SWOT (Creative & Cultural Skills, 2013). Satisfactory and Faults dimensions dealt with present factors, while Opportunities and Threats dimensions dealt with future factors.

SWOT was first mentioned in 1964 by Urick and Orr, during Humphrey's seminar on "Seminar in Long Range Planning" in Zurich, Switzerland. SWOT came about when Urick and Orr proposed to replace "Satisfactory" with "Strengths" and "Faults" with "Weaknesses." After the seminar, Urick and Orr started promoting the newly minted SWOT concept in the United Kingdom (Agyapong and Nyarku, 2011)[18]. Another significant development took place in 1982, when Heinz Weihrich proposed the 2x2 TOWS (Threats, Opportunities, Weaknesses, Strengths) matrix for carrying out the SWOT competitive analysis focus from current state to the more distant future. The TOWS Matrix was subsequently renamed to SWOT matrix (Thakur, 2010).

SWOT analysis was traditionally applied to assess the competitiveness of an industry, firm, organization, product, project, and/or service. Only two instances were found in the literature where SWOT analysis was used to assess national regulatory frameworks (Gilabert et al., 2010; Al-Kandari, and Jukes, 2011). They applied the SWOT analysis to assess the implementation of the Hazard Analysis Critical Control Point (HACCP), a national food safety regulatory framework, in Madagascar and the United Arab Emirates, respectively. However, it was used to assess structures and context of the implementation of a specified regulation, HAACP, rather than the impact of its implementation.

The *British Columbia Seafood Sector and Tidal Water Recreational Fishing: A Strengths, Weaknesses, Opportunities, and Threats (SWOT) Assessment*, is an example of using SWOT analysis in the public sector/government context (British Columbia Ministry of Agriculture, Food and Fisheries, 2004). However, as indicated in the report's title, the SWOT sought to assess the competitiveness of particular sectors (seafood and tidal water recreational fishing) instead of assessing impacts of new regulations. Accordingly, the assessment in this report will utilize SWOT in a way not previously seen in the literature.

[18] SWOT can also be trace back to Harvard in the 1960s and 1987 Ansoff's Matrix (Friesner, 2011).

Appendix B - type of employer establishments – NAICS 1141

Number of Establishments in Canada by Type and Region: December 2011 Fishing, Hunting and Trapping (NAICS 114)				
Province or Territory	**Employers**	**Non-Employers/ Indeterminate**	**Total**	**% of Canada**
Source: Statistics Canada, Canadian Business Patterns Database, December 2011.				
Alberta	9	32	41	0.4%
British Columbia	309	1,350	1,659	17.3%
Manitoba	59	111	170	1.8%
New Brunswick	1,312	227	1,539	16.0%
Newfoundland and Labrador	233	894	1,127	11.7%
Northwest Territories	4	3	7	0.1%
Nova Scotia	2,011	880	2,891	30.1%
Nunavut	5	3	8	0.1%
Ontario	84	83	167	1.7%
Prince Edward Island	327	741	1,068	11.1%
Quebec	703	173	876	9.1%
Saskatchewan	5	31	36	0.4%
Yukon Territories	1	4	5	0.1%
CANADA	5,062	4,532	9,594	100%
Percent Distribution	52.8%	47.2%	100%	

Source: http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis-sic114etbe.html

Appendix C – Type of employer establishments - NAICS 3117

Number of Establishments in Canada by Type and Region: December 2011 Seafood Product Preparation and Packaging (NAICS 3117)				
Province or Territory	**Employers**	**Non-Employers/ Indeterminate**	**Total**	**% of Canada**
Source: Statistics Canada, Canadian Business Patterns Database, December 2011.				
Alberta	1	2	3	0.3%
British Columbia	89	69	158	17.7%
Manitoba	7	2	9	1.0%
New Brunswick	90	15	105	11.8%
Newfoundland and Labrador	81	71	152	17.1%
Northwest Territories	0	0	0	0.0%
Nova Scotia	216	62	278	31.2%
Nunavut	3	1	4	0.4%
Ontario	35	6	41	4.6%
Prince Edward Island	28	25	53	5.9%
Quebec	63	23	86	9.7%
Saskatchewan	1	1	2	0.2%
Yukon Territories	0	0	0	0.0%
CANADA	614	277	891	100%
Percent Distribution	68.9%	31.1%	100%	

Source: http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis-sic3117etbe.html

Appendix D – Wild fish and seafood exports

Note: The percentage values for Nunavut, Northwest Territories and Yukon have been amalgamated for the purpose of this graph.

Table 3. 2011 Fish and Seafood Export Value per Province and Territory

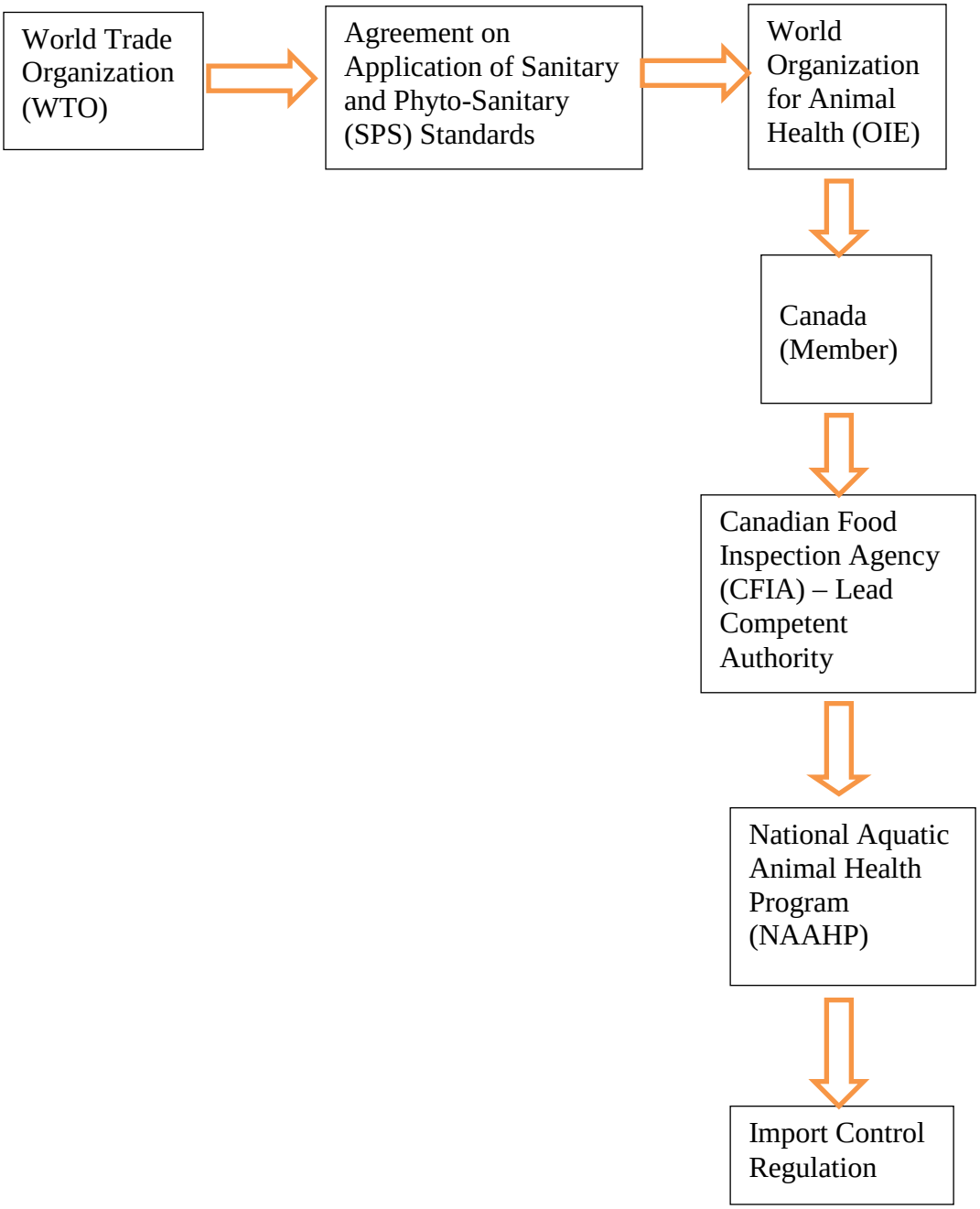
Province	2011	Percentage
Newfoundland	852,440,285	24
Nova Scotia	899,542,406	25.3
New Brunswick	673,777,168	19
Prince Edward Island	139,279,824	3.9
Quebec	264,432,074	7.4
Ontario	88,625,795	2.5
Nunavut*	269,610	0.02
N.W.T.*	128,277	X
Yukon*	169,964	X
Prairies	59,140,497	1.7
British Columbia	577,665,949	16.2
Total	**3,555,471,849**	**100**

*The percentage values for Nunavut, Northwest Territories and Yukon have been amalgamated for the purpose of this table.

Source:

http://www.dfo-mpo.gc.ca/fm-gp/sustainable-durable/fisheries-peches/stats2011/wild-sauvages-eng.htm#ch13

Appendix E - Aquatic Animal Health Governance Structure – Global to Local



Source: This diagram is author's creation, with ideas taken mainly from Brückner (2009).