

**Blue mussel farming –
a comparison of the Norwegian and the Canadian industries**

by

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Preface

Endeleg! Det er litt spesielt å kunne setje punktum for dette arbeidet. Å skrive ei slik oppgåve samstundes som ein er i full jobb er ikkje optimalt. Då må ein i alle fall ha nokon heime som har tolmod til å vente utover kvelden og ikkje legg planar for fellesaktivitetar i helgene. Det har eg hatt. Tusen takk Cecilie!

Tusen takk også til min tolmodige, strukturerte og dyktige rettleiar, Peter Arbo.

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Summary

Since the 1970s, many attempts have been made in Norway to turn blue mussel farming into a growth industry. Total production has increased during the last ten years, but prices have decreased and the value of the Norwegian production has fluctuated greatly. Many blue mussel farming companies have failed. Hence, the results have not been as expected. The Canadian story is different. In contrast to what has happened in Norway, some Canadian provinces – notably Prince Edward Island - have had a great success in blue mussel farming. During the same period they have developed this activity into a viable industry.

This thesis compares the development of blue mussel farming in Norway and Canada. Why has the Canadian industry fared better than its Norwegian counterpart? In order to highlight the issue, the thesis focuses on the bottlenecks and barriers for the development of blue mussel production in the two countries and how these challenges have been dealt with. The study is based on interviews with eleven different companies and five different governmental and membership organizations in selected regions in Canada and Norway. In addition, a wide range of secondary sources have been used.

The main findings are that the two industries are facing rather similar natural challenges. Toxicity is a common threat and at the moment invasive species is becoming a growing problem in Canada. What differentiates the two industries is that blue mussel farming in Canada was initiated as a response to declining fisheries. This may partly explain why the Canadian industry has been more successful. The infrastructure for industrial support also seems to be better co-ordinated in Canada than in Norway, and the Canadian producers have the benefit of a large domestic market and proximity to the US market, while the Norwegian producers have a small domestic market and greater difficulties gaining access to the well-established European market. However, these conclusions must be regarded as provisional considering the limited amount of data on which this thesis is built.

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1. Introduction

Norway has had great success in salmon farming. Starting in the early 1960s, the industry has seen a tremendous growth. Today, the salmon breeding industry is a global industry with a multi billion turnover. The rapid rise of this new industry has triggered a growing interest in other marine species. The expectations have been to repeat and extend the achievements obtained in salmon farming.

Blue mussel (*Mytilus edulis*) is one of the new species which have been pursued as a potential industry since the beginning of the 1970s. The Norwegian coast line should be well suited for blue mussel farming, with productive and protected waters, and many people envisaged a new success-story in Norwegian aquaculture. But despite widespread hopes of rapid growth, the development of the industry has been no easy and smooth process. Blue mussel farming in Norway has been riddled with problems. Compared to Atlantic Canadian blue mussel farming, the Norwegian business is clearly lagging behind although the basic conditions in the two countries seem to be fairly similar.

The overall aim of this thesis is to shed light on the divergent development of the blue mussel farming industries in Canada and in Norway. Why has the Canadian industry apparently fared much better than its Norwegian counterpart?

1.1 Species and geographical distribution

The specie *Mytilus edulis* is widespread and found from northern parts of Spain in the south to Russia in the north. In Norway it is found along the entire coastline, but mainly up to Trondheimsfjorden, It thrives in protected waters and in fjords with brackish water. Blue mussel is fastened to rocks or other surfaces by byssus and often found in dense populations in the tidal zone. It is also found on the west side of the Atlantic Ocean, from Carolina in the US to Newfoundland in Canada. Outside Europe, this is the only known spread of the *Mytilus edulis* (Hovgaard et al., 2001).

There is some uncertainty when it comes to how many species of blue mussels that exist. This is due to the fact that they are difficult to separate both genetically and by appearance. In Europe there is one other specie in addition to *Mytilus edulis*, the *Mytilus galloprovincialis*.

The *Mytilus galloprovincialis* is found at the northern coasts of the Mediterranean Sea, around the Iberian Peninsula and north to the British Islands (Hovgaard et al., 2001).

In Canada, the specie *Mytilus trossulus* is farmed along with the *Mytilus edulis*. There is no reliable way of distinguishing the two species simply by colour or shape. Characteristics of the external shell vary according to environment. Species display shell coloration ranging from dark blue to light brown, and shell shape varies from almost round to elongated - almost “banana” shape. The only reliable way to distinguish the two species from each other is by genetic determination. There is, however, consensus among researchers that both species are commercially acceptable and viable (Brown et al., undated). In Chile, the specie which is farmed is the *Mytilus chilensis* (Toro et al., 2006). *Mytilus chilensis* is widely distributed along the Chilean coastline.

1.2 Biology

Blue mussels are of the mollusc-family. The familiarity with the vertebrates is fairly remote. The shell of a blue mussel consists of two parts, both are symmetrical and the right and left part is equally curved. Farmed mussels have a thinner shell than mussels growing on the sea bed (Hovgaard et al., 2001).

Blue mussels are unisexual. In most stocks there are a similar number of the two sexes. Sexual maturity can be attained in the first year of life, but is more common in the second (Hovgaard et al., 2001). Canadian literature reports of sexual maturity within the first year of life, often spawning at 8-10 months of age (Brown et al., undated). Blue mussels develop their reproductive gland throughout the winter months and spawn in the summer months (Hovgaard et al., 2001). A variety of factors have been suggested as spawning triggers for mussels, including temperature thresholds, temperature changes, storm surges, tide changes, food supply and even mechanical shocks. Food abundance and temperature appear to be implicated most often in the spawning behaviour of mussels (Brown et al., undated).

In the spawning process, mussels release their eggs or sperm into the water and the embryos transform into swimming larva. Swimming occurs only a few hours after the embryo is formed and in this stage it feeds on small phytoplankton and grows to the first larvae stage. The larvae are free swimming 3 to 4 weeks until the final metamorphosis when they seek to

settle. At metamorphosis, the mussels use the foot to secrete byssi threads to initially fasten themselves to solid substrate such as collectors, wharf-pilings or rocks. The mussel is now referred to as juvenile mussels and they can easily detach themselves and change locations, either by using their foot to actively crawl or by floating passively in the water column (Fisheries and Oceans Canada, 2003:10).

Mussels feed on natural food particles in the water, by filtering the water through their gills. An average 50 mm mussel weighing 1 g dry weight of tissue will filter 2 litres per hour or about 50 litres of sea water per day (Brown et al., undated). The food consists of algae, detritus (dead particular organic material), bacteria and other micro organisms. However, algae are the most important source of food for blue mussels. Feeding and growth is closely linked to changes in production of phytoplankton throughout the year (Hovgaard et al., 2001).

1.3 Historical use

It is known that blue mussels were an important source of food to man in prehistoric times. Findings show that blue mussels were a staple in the diet even at 6000 years B.C. Mussel shell was also used in the Stone Age as a form of payment when bartering for other goods (Hovgaard et al., 2001). In European countries, blue mussels have been harvested for food and also used as fertilizer (FAO, 2007:1).

Blue mussels were also used as bait in Norway from the 14th century until the middle of the 20th century (Hovgaard et al., 2001). Bait was a necessity when fishing with hooks, and blue mussel and other species of mussels were harvested for this purpose (Skjellmanualen, undated). Frozen mackerel and herring replaced the mussels as bait when the new freezing technology came along in the 1950s in Norway (Hovgaard et al., 2001).

1.4 Global production

In 1998, Europe produced half of the total production of 500 000 tons blue mussels (included the *Mytilus*-family, but also the green mussel specie *Perna*). 80% of this was farmed mussels (Hovgaard et al., 2001; Johnsen, 2003). Global farmed production (see figure 1.1) of blue mussels (*Mytilus edulis*) increased rapidly in the last half of the 20th century. In 1998 there was a peak in production with more than 500 000 tons produced world-wide. However,

world-wide production is unstable and there has been a decline since 1998 with production under 400 000 tons in 2005 (FAO, 2007:7).

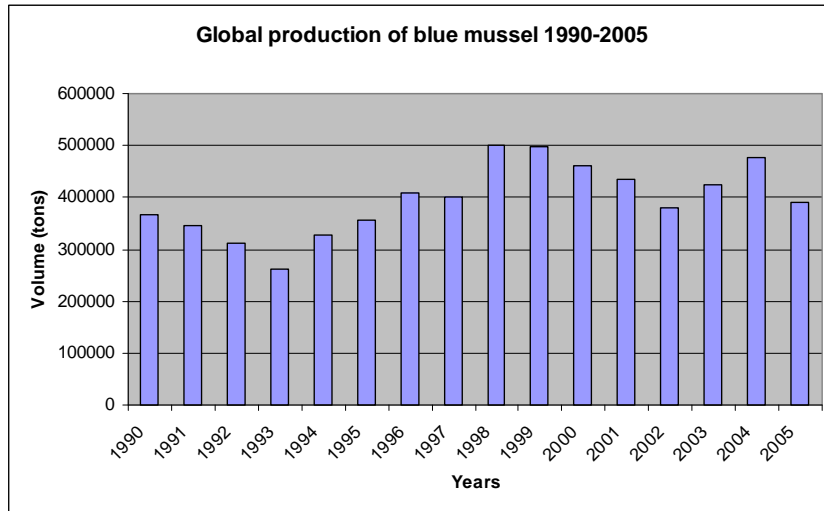


Figure 1.1 Global aquaculture production of *Mytilus edulis* from 1990 to 2005 (FAO/Fishstat Plus)

A closer look at the major producers of blue mussels in the world (see figure 1.2) reveals that Spain is by far the largest producer, even though production has decline in recent years. The second largest producer in 2005 was Chile, where the production has been growing steadily since the 1990s. The specie grown in Chile is the *Mytilus chilensis*. Other large European producers are France, the Netherlands, Ireland and UK.

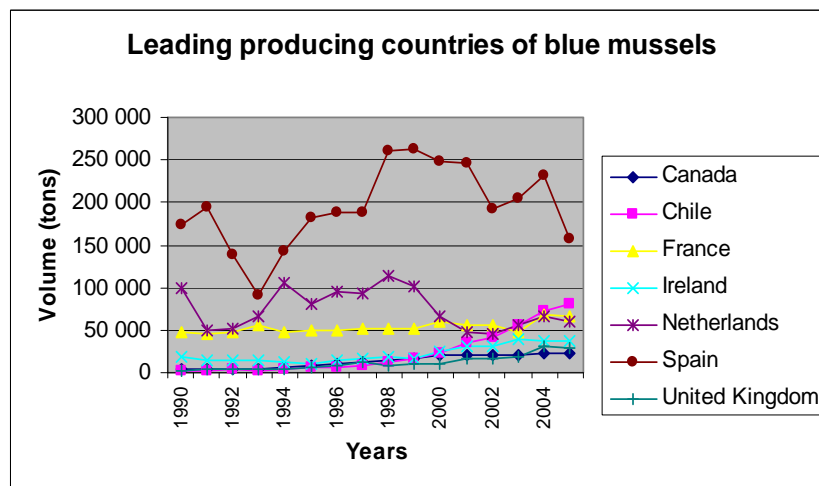


Figure 1.2 Biggest producers of blue mussels 1990 – 2005 (FAO/Fishstat Plus).

The value of the world production of farmed blue mussel shows two major trends since 1984 (see figure 1.3): First a cyclic growth and decline from 1984 till 1993, then a steady growth

from 1993 till 2005. In 2005, the value of the world production was over US\$385 000 000 (FAO/Fishstat Plus).

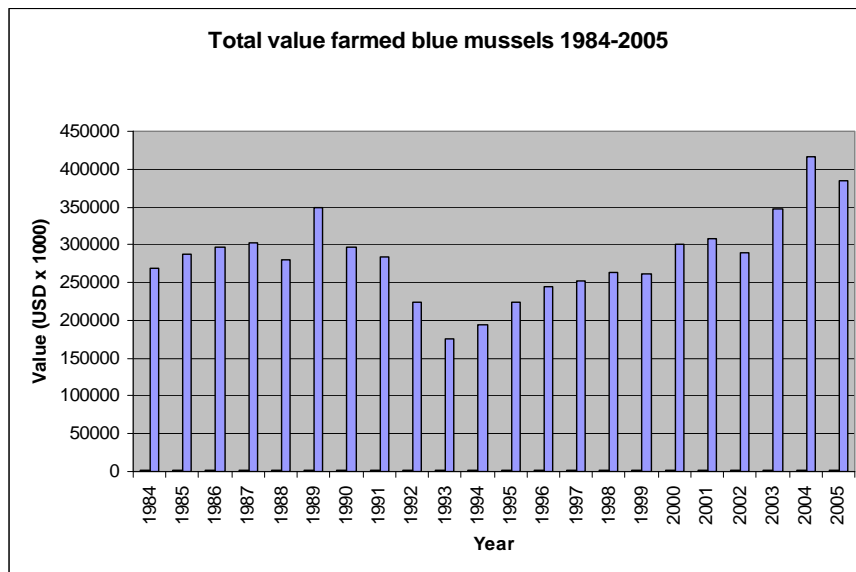


Figure 1.3 Total value of production of farmed blue mussels 1984 - 2005 (FAO/Fishstat Plus)

1.5 Trade and markets in Europe

The central European countries have a long tradition of consuming blue mussels. Consumption per capita in countries like France, the Netherlands and Belgium is quite large compared to Norway. France and the Netherlands are producing and importing blue mussels, while Belgium is totally dependent on import, as the country has no domestic production (Johnsen, 2003). Europe has traditionally been a high-value market and the prices are fluctuating due to landings from wild mussel fishery (FAO, 2007).

France is consuming between 130 000 and 150 000 tons and is the single most important market in Europe. France is also a blue mussel producing country and has a production which supplies approximately 60% of the domestic consumption. The rest is bought from countries such as the Netherlands in the winter and Great Britain and Ireland in the summer months (Johnsen, 2003). Import from other countries is also linked to the spawning season of the domestic production (FAO, 2007).

When it comes to consumption per capita, Belgium has the highest consumption (2,75 kg per inhabitant a year). This is the best paying market in Europe. Annual import to Belgium is

about 25 000 to 28 000 tons (Winther et al., 2006). Estimates suggest that blue mussels are bought by 45% of the Belgian households. The buyers are mainly between 35 and 64 years and belong to high income groups. The Netherlands is the single most important supplier of blue mussels to Belgium (Johnsen, 2003).

The various European markets have different preferences regarding quality, colouration, size and filling. In general, the consumers in the Netherlands and Belgium prefer bigger mussels than the French consumers (Winther et al., 2006).

According to FAO (2007), the European production of blue mussels is facing a real challenge in seed shortage and deterioration of the water quality. Seed shortage is a problem in Ireland, the Netherlands and has also been a problem in France. In Ireland there is a risk of over-exploitation of the natural beds of seed. The Netherlands has imported seed from countries such as Germany, France and the UK. The reason for this is mainly that the sea beds which were used for spat and seed production have been closed to create a food reserve for eider ducks and oyster catchers. The general rising temperature in the sea is also causing problems. In 2003 a massive heat wave increased the temperature in the French waters. The result was that a large percentage of the mussel spat died. If this is to become a regular occurrence it might be a severe challenge to the industry.

1.6 Norwegian blue mussel farming

There have been several attempts in Norway to build an industry out of blue mussel farming. Despite being introduced in the early 1970s, blue mussel farming is still considered an infant industry. In the 1970s there was an early boom and many growers started up blue mussel farms in Norway. This was soon followed by a collapse (Skjellmanualen, undated).

The next attempt to build a blue mussel industry came in the early 1980s. Whether this was a new initiative or just a gliding transition from the 1970s is not clear, but the result was the same as in the 1970s (Skjellmanualen, undated). This scenario repeated itself in the 1990s when the next attempt failed (Hovgaard et al., 2001).

The volume of the production of blue mussel in Norway has shown an increase since 2000, when the production was only 850 tons (see figure 1.4). The increase from the year 2000 up to 2005 was by 405%. However, the production in 2007 dropped to 2500 tons, a decline from the two previous years (Fiskeridirektoratet, 2008).

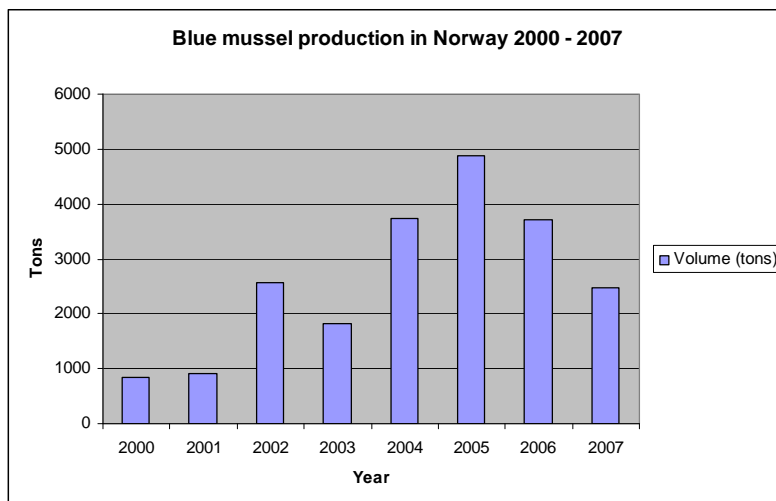


Figure 1.4 Volume of blue mussel production in Norway, 1990 - 2005 (Fiskeridirektoratet, 2008)

Figure 1.5 (next page) illustrates the value of the Norwegian blue mussel production. In 2000 it was 5 340 000 NOK. In the following years the value has fluctuated, and 2005 was so far the best year with a value of over 20 million NOK (Fiskeridirektoratet, 2008). The average price/kg (first hand value) has been down since year 2000, but went up from 2006 to 2007.

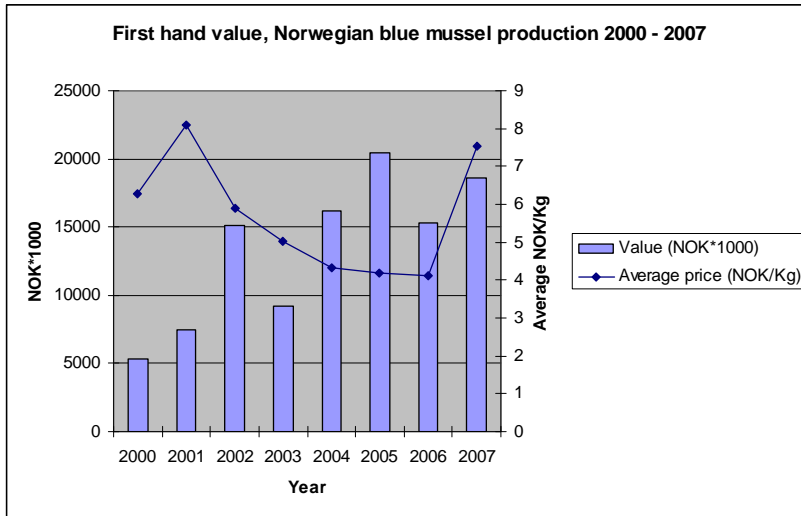


Figure 1.5 First hand value of the Norwegian production of blue mussel 2000 - 2006 (Fiskeridirektoratet, 2008)

Norwegian production is to be found all along the Norwegian coast, but some counties are producing more than others. The counties of Nordland, Nord/Sør-Trøndelag and Rogaland are the top producers, producing more than 500 tons in 2006 (see table 1.1).

County/Year	2000	2001	2002	2003	2004	2005	2006
Finnmark	2	1	0	1	0	60	0,1
Troms	0	0	0	0	0	1	0,3
Nordland	34	40	45	100	405	479	653,9
Nord-Trøndelag	230	110	121	143	681	536	734,1
Sør-Trøndelag	354	186	585	271	671	812	520,1
Møre og Romsdal	2	1	54	11	47	79	69,2
Sogn og Fjordane	202	43	37	419	319	627	99,3
Hordaland	0	105	169	287	474	373	381,5
Rogaland	19	218	976	353	461	638	522,6
Other counties	9	216	570	245	688	1 280	733,0
Total	851	920	2 557	1 829	3 747	4 885	3 714

Table 1.1 Norwegian production of blue mussels (tons), distributed by county (Fiskeridirektoratet, 2008)

Most of Norway’s blue mussel production is exported to other European countries, much because of the small domestic consumption. Norwegian domestic market consumes approximately 1000 ton per year, which is about one fourth of total Norwegian production (Sandberg et al., 2007). Compared to other European countries, the Norwegian consumption per capita is quite small. In 2003 each Norwegian citizen consumed on average 0,13 kg blue mussels and domestic consumption was 640 tons. Blue mussels sold on the domestic market are mostly sold fresh in small net packages, holding 1-2 kilo mussels.

Norwegian blue mussels are mainly exported in bulk, also named big-bags, which is sacks containing several hundred kilos. In the export statistics this is defined as packages containing over 25 kilos. Figure 1.6 shows the major importing countries of bulk mussels from Norway in 2006.

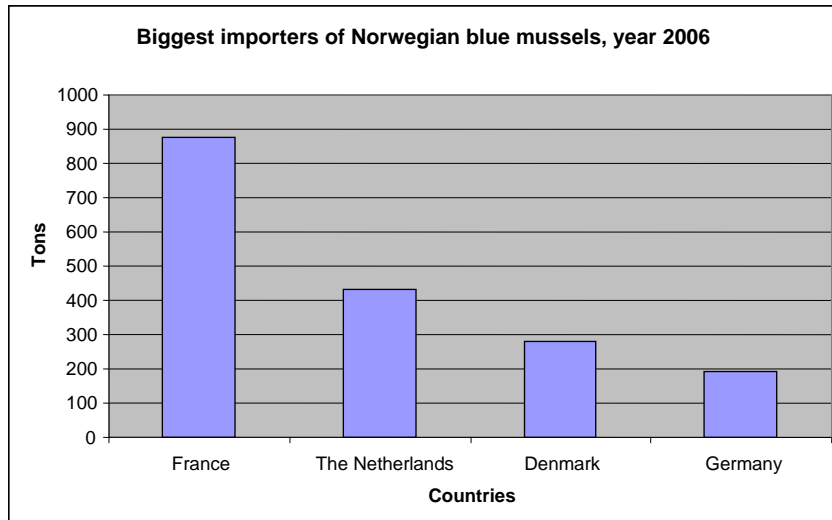


Figure 1.6 Importers of blue mussels from Norway in 2006 (EFF, 2006)

France imported most of the Norwegian production in 2006 (EFF, 2006), but the Netherlands, Denmark and Germany were also major importers. The European market is dominated by three big importers of blue mussel; France, the Netherlands and Belgium.

In 2006 France was the major importer of Norwegian farmed blue mussels, importing 875 tons of Norwegian blue mussels. The major part of this, 866 tons, was in packages over 25 kg (EFF, 2007), (Norsk fiskeoppdrett, nr 3, 2008).

The Netherlands is also a major player in the European blue mussel trade, both as a producer and as an exporter. Norway exported 947 tons to the Netherlands in 2006 (EFF, 2007). Denmark was the third largest importer of Norwegian blue mussels, and bought 281 tons from Norway that year.

However, prices gained by the Norwegian exporters have been quite low. The average price on export in the period from 2002-2005 was between NOK 3, 30 pr kg and 5, 75 (Sandberg et al., 2006).

Norwegian consumption is showing a positive trend, mainly among people in the age group of 30 to 59 years. Consumption is also rising among young people. In general, the Norwegian consumers are less demanding when it comes to quality. They do not have the highly specified preferences as the customers in more developed blue mussel consuming nations in Europe (Johnsen, 2003).

It is interesting to compare the Norwegian and the Canadian blue mussel industries, as the basic conditions in the two countries seem quite similar and in neither of them the industry has a long history. The following section gives a brief introduction to the Canadian blue mussel industry.

1.7 Canadian blue mussel farming

Canada is in Norway regarded as a country with success in the field of blue mussel farming. Statistics show that Canada produced 22 842 tons of blue mussel in 2005 (figure 1.8). This was five times the production in Norway the same year (FAO/Fishstat Plus).

Blue mussel farming activity is mostly found in the north-western part of the Canada and the major farming areas are in the Gulf region. This region consists of all the waters of the Gulf adjacent to the eastern coast of New Brunswick (Eastern NB), the Northumberland Strait coast of Nova Scotia (NS) and Western Cape Breton Island known as Gulf NS, as well as the whole of Prince Edward (Fisheries and Oceans Canada, 2003:5).

Canada has developed its blue mussel industry since the beginning of the 1990s. From producing less than 5000 tons in 1990, the industry gradually developed during the following years.

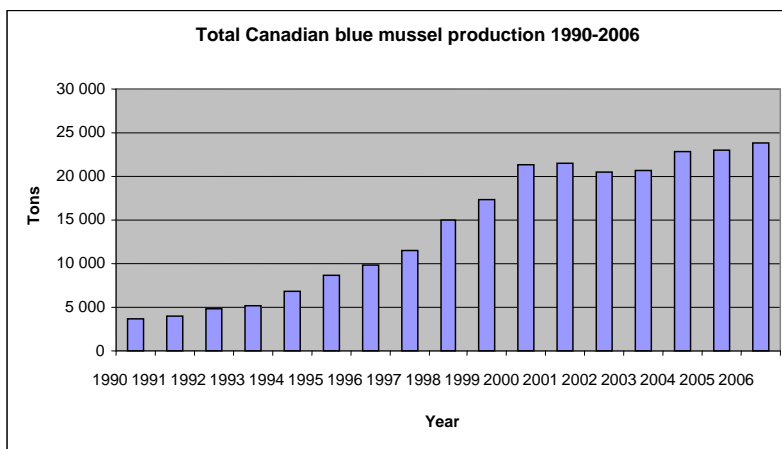


Figure 1.7 Canadian blue mussel production, 1990-2006 (Fisheries and Oceans Canada, 2003)

As shown in figure 1.7 the Canadian production of blue mussels has grown steadily since 1990. From year 2000 and until 2006, the production was not growing by the same rate as in the 1990s but levelled out at nearly 25 000 tons. Figure 1.8 includes all the districts in Canada that has aquaculture production of blue mussels.

As shown in table 1.2 (next page) some regions are producing more blue mussels than others.

PROVINCE	Quantity	Value
Prince Edward Island	80.8%	76.1%
Newfoundland	6.7%	12.9%
Nova Scotia	7.5%	6.6%
New Brunswick	3.5%	2.7%
Quebec	1.6%	1.7%
Others	-	-
CANADA	100 %	100%

Table 1.2 Production of cultured mussels, distribution by province in Canada year 2001 (Fisheries and Oceans Canada, 2003)

Most of the production of blue mussels in Canada is found on Prince Edward Island. Production on the island started in the 1980’s and has shown an increase every decade since. *Mytilus edulis* is the major species grown, but also strain of the *Mytilus trossulus* is found in the rope cultures (Hovgaard et al., 2001).

Interestingly, the value per kg mussel produced in Canada has been slightly growing (figure 1.8) even though the total volume has increased (figure 1.7). This might indicate that the Canadian farmers and exporters are doing the right things towards the market.

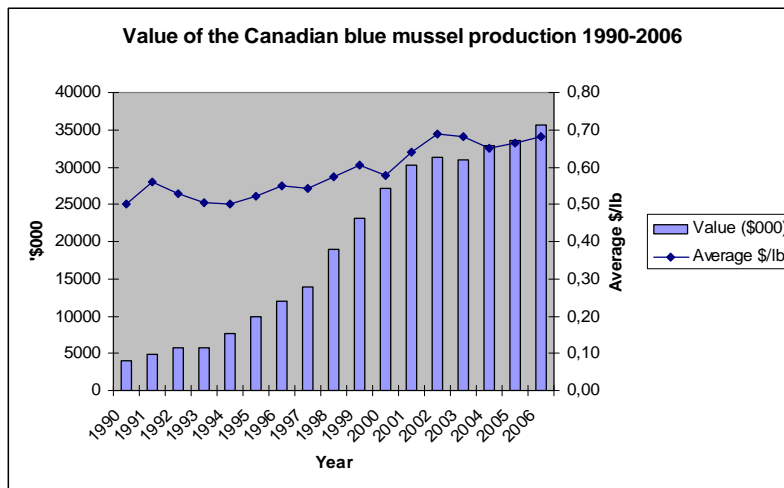


Figure 1.8 Value of the Canadian blue mussel production 1990 - 2006 (Statistics Canada, 2008)

Compared to Canada, the volume of the Norwegian production was in 2005 only 19 % of the Canadian production, and the value in the same year was 12,2 % of the Canadian value of blue mussel production (1 Canadian \$ equals 5,5 NOK).

Most of the mussels grown in Canada are sold fresh in the shell. Quality is normally best in the months between October and June, but development in the industry during the last decade has enabled some farmers to deliver fresh mussels on a year-round basis. In the Gulf region there have been some attempts towards value added mussel products, i.e. mussels prepared in sauce, smoked and pasteurized mussels, but still most of the mussels are sold fresh in the shell (Policy and Economics Branch, 2006).

Different local markets play a minor role when compared to the larger Canadian urban centres. Cities such as Vancouver, Toronto, Quebec City, Montreal and Calgary are the main destinations for the domestic shipments. The primary export market for Canadian mussels is the United States. Massachusetts, Maine and New York are the main destination for Canadian blue mussel export. In 2004, the US imported 8081 tons which was 35% of the total Canadian production that year. Japan (frozen), Belgium and Israel imported some mussels from Canada in 2001, but the amounts were relatively small compared to the US import (Fisheries and Oceans Canada, 2003).

It seems like the Canadian blue mussel industry has had an earlier and bigger success than the Norwegian industry. Measured both in volume and value, the Canadian blue mussel industry is showing better results.

1.8 Topic and research question

As outlined in this chapter, the Norwegian and Canadian blue mussel industries have diverged in their development. Both in volume and in value the Canadian blue mussel industry has outperformed the Norwegian, despite the favourable natural conditions along the Norwegian coast. How can this be explained? Why has the Canadian industry been more successful than the Norwegian industry?

In this thesis I compare the blue mussel industry in two regions in Canada with the corresponding industry in two regions in Norway. I analyze what kind of barriers and bottlenecks the blue mussel industry has faced in the two countries, and how these barriers have been dealt with. The main research question to be addressed is thus:

“What are the main challenges for blue mussel production in Norway and Canada and how has industry and government in the two countries tried to solve the problems?”

In order to identify potential barriers and bottlenecks I have concentrated on the following aspects:

- Biophysical conditions
- Technical boundaries
- Financial issues and availability of funding
- Market proximity/marketing
- Research/educational infrastructure
- Regulatory framework

My hypothesis is that the Canadian industry is showing better results because the industry and the surrounding support system have worked more methodically and closer together to solve key problems for the industry.

To clarify these issues I have visited and interviewed several companies in Norway and Canada to learn about their experiences and what has been done in different regions. Representatives of various governmental bodies and organizations related to the blue mussel industry have also been interviewed.

Due to time and budget restraints, the survey was limited to two geographical areas in Norway (Sogn og Fjordane and Nord-Trøndelag counties) and Quebec, Nova Scotia and Prince Edward Island in Canada.

The main reason for comparing the industry in Canada and Norway is that I am preoccupied with what the Norwegian blue mussel industry can learn from the Canadian industry. Even though other countries have a longer history in farming blue mussels and occupy a more central position in the international blue mussel industry, the Canadian case might be of special interest because of the many parallels between the two countries. The Norwegian blue mussel farming industry is still fragmented and fragile, and I decided to compare Norwegian companies with more mature companies from the leading regions in Canada.

The thesis is structured the following way: In the next chapter I give a short introduction to theories of entrepreneurship and innovation. This provides an analytical framework for the study. The following chapter is about the methodological approach and the key decisions taken during my work. Chapter four gives a more detailed review of blue mussel farming in Norway and Canada. In chapter five I present the main findings from my own interviews. This is in chapter six followed by a discussion of similarities and differences between the Canadian and the Norwegian industries. Chapter seven rounds up the thesis and gives the conclusions.

2. Entrepreneurship theory

Blue shell farming in Norway is by many considered as an entrepreneurial activity. Companies are small, often owned and run by the same people, and the field of business is characterized by a series of difficulties. Biology, marketing, economics and technical challenges have to be overcome in the pursuit of building a profitable industry. Still, blue mussel farming attracts people who are willing to put time, effort and money into the business believing that an economical surplus will be generated in the future. I am interested in innovation, entrepreneurship and industrial development in the context of blue mussel farming. Theories of entrepreneurship and innovation are thus relevant to shed light on the research problem that I have defined. This chapter is meant to provide a theoretical frame of reference.

2.1 The history of entrepreneurship

There is no universally agreed definition of entrepreneurship. The term entrepreneurship is widely used both in everyday conversation and as a technical term in management and economics (Wickham, 2006). Modern entrepreneurs such as Ingvar Kamprad (IKEA), Erling Persson (Hennes & Mauritz) and Kjell Inge Røkke (Aker) have one thing in common; they started from scratch and built profitable businesses.

The term “entrepreneur” has a French origin. In its widest sense it means “someone who gets something done”. The word initially referred to contractors who were in charge of grand building projects like churches, castles and public buildings. It first appeared in a French dictionary in 1437. The 16th century brought a new definition of the word; someone taking risk (Landström, 2005).

Defining entrepreneurship as a science is often credited to Richard Cantillon (ca 1680 – 1734) and Jean Baptiste Say (1767 – 1832), as they introduced the term entrepreneurship into the economical literature. This means that entrepreneurship is not a new science. In many ways modern industrial society was built through entrepreneurial ideas and a strong will of enterprise. Entrepreneurship theory is not only related to sectors producing tangible objects. The service sectors including IT and communications are also modern examples of industries with entrepreneurship (Landström, 2005).

In Germany in 1911, Schumpeter published “The Theory of Economic Development”. He presented a theory on economic development in which the entrepreneur was a central character. His work brought a new definition of entrepreneurial activity. In Schumpeter’s theory the entrepreneur took the role as an agent of change by combining different resources (raw materials, technology and methods of production) and thereby creating new products (Spilling et al., 2006).

According to Schumpeter, such changes and new combinations of input factors might occur in five different ways:

1. Introduction of a new product which is new to the consumers
2. Introduction of a new way of producing a product
3. Entering a new market
4. Using a new type of raw material or semi-finished products in the production process.
5. New organization within an industry, i.e. creating a monopoly or disturbing an established monopoly (Spilling et al., 2006).

Schumpeter argued in his work that innovation is the motor of economic development. This was a radical break with theories focusing on the allocation of given resources and the equilibrium between supply and demand. An innovation brings something new into the world. Hence, it alters the existing equilibrium conditions (Landström, 2005). In modern literature, innovation is defined as something beyond an invention. It means doing something in a way that is new, different and better (Wickham, 2006) or being the first to commercialize an idea (Fagerberg, 2003).

Innovation is the result of entrepreneurial action. Entrepreneurs see the possibilities for business and introduce innovations. Thereby he or she differentiates themselves from other business actors (Landström, 2005). Today an entrepreneur is conceived of both as a manager undertaking particular tasks and as a character that has a function in facilitating economic progress. The entrepreneur can be regarded as a manager and entrepreneurship as a style of management (Wickham, 2006).

However, there is a fine line between being an entrepreneur and starting up an ordinary business. According to Schumpeter’s definition, “new combination” had to be involved, i.e.

things had to be done in a new way. It is not sufficient to copy an existing enterprise or operation. Other researchers have applied wider definitions of entrepreneurship. Davidsson (2003) is including imitative ventures as a form of entrepreneurship. He justifies this by saying that any new business that enters an existing market will influence the situation in this market (Spilling et al., 2006).

Schumpeter introduced a new perspective on economic development which departed from the neo-classical approach. He emphasized the key role of entrepreneurship and innovation (Fagerberg, 2003). The long cycles of economic development were linked to basic innovations changing the general economic landscape. Over time the centres of innovation would be shifting both sectorally and geographically. His theory stated that if a firm in a given industry or sector succeeds in the introduction of an innovation, it will be rewarded with higher profit than the competitors. Innovation is a mean to obtain a temporary monopoly. However, this is a signal to other firms to follow suit. As they swarm into the same business, the advantages of the first mover quickly erode. Schumpeter moved this theory further by assuming that imitators were much more likely to succeed in their aims if they added a modification to the original innovation. Hence, they had become innovators themselves and the innovation diffusion process would be a creative process were one innovation sets the stage for a series of new innovations and economic growth.

Schumpeter acknowledged the organizational aspects of innovation. An organizational innovation is not limited to a rearrangement of the production process but might imply a reorganization of entire industries and new ways to serve customers. One example is the new distribution systems introduced in the United States in the first half of the 20th century.

One weakness in Schumpeter's early approach towards innovation was his focus on the individual entrepreneur. He did not take the necessary teamwork and collective efforts into account. In his later work, however, he acknowledged the importance of cooperative entrepreneurship in the context of large organizations. This must be seen in the light of the transitions taking place from an economy dominated by small firms to an economy dominated by huge corporations with their own in-house R&D departments. The big companies brought about more pluralistic leadership models (Fagerberg, 2003).

In current thinking about innovation, attention has shifted from the individual entrepreneur to clusters or systems of innovation. Innovation systems can be national, regional or sectoral. Isaksen (1997), for instance, says that a regional system comprises all the companies and regional localized institution which contribute to the development and diffusion of innovations. Globalization and the distribution of supply chains and production processes throughout the world have resulted in a restructuring of most industries. To counter an exodus of production to low-cost countries, governments in the industrialized countries have launched industrial and technology policy measures to strengthen the domestic industries' ability to compete by being innovative.

An innovation system can be defined in both a narrow and a broad sense. A narrow definition includes institutions and organizations which are involved in searching and exploring, i.e. research and development departments, technological institutes and universities. The broad definition comprises all parts of the economic structure and the institutional set-up affecting learning as well as searching and exploring, the production system, the marketing system and the system of finance (Asheim, 1994). Spilling (2006) also includes infrastructure, information agents, cultural and social conditions and the political system in his definition.

In general, the basic elements of an innovation system are the production structure and the institutional infrastructure (Asheim, 1994). The core idea behind the term innovation system is that the innovation performance and competitiveness of a country, region or an industry depends upon the ways companies interact and how various institutions are linked. A system-oriented perspective on innovation thus underscores that innovation is taking place within an institutional framework and is premised on cooperation between a series of different actors (Spilling, 2006).

This implies that entrepreneurship today is placed in a broad social context. The popularity of the term "network" clearly illustrates how the social setting has come to the front. Networks can be informal and include family, friends and business peers or they can be formal as in transactions with banks, accountants, lawyers, etc. The growing interest in "incubators" is in many ways a symbol of the recognition of the importance of the social setting in which an entrepreneur operates. A formally organized incubator offers space, support services, technical and business consulting services and contact with other entrepreneurs (Low & MacMillan, 1988).

2.3 Types of innovation

Entrepreneurship and innovation are closely linked. However, it is important to keep them separated because the innovator does not have to be the entrepreneur. The path from initially developing something new and to finally setting up a new business is often long and narrow. Analyzed the other way around, the entrepreneur does not have to be the innovator or the one who initially had the innovative idea. The role of the entrepreneur is to develop the new business opportunities (Spilling, 2006).

Innovations can be categorized in several different ways, depending on where they are implemented and how strongly they affect the relevant industry (Wickham, 2006). Incremental innovations are minor improvements to an existing technology with low market potentials. Innovations with higher market ambitions but still based on modifications to an existing technology, can be described as new insight innovations. If the innovation has limited market ambitions and appeal only to a minor customer group, it can be characterized as a specialist innovation. If the innovation is based on new technology with high market impact ambitions, the innovation can be labelled a new world innovation (see figure 2.1)

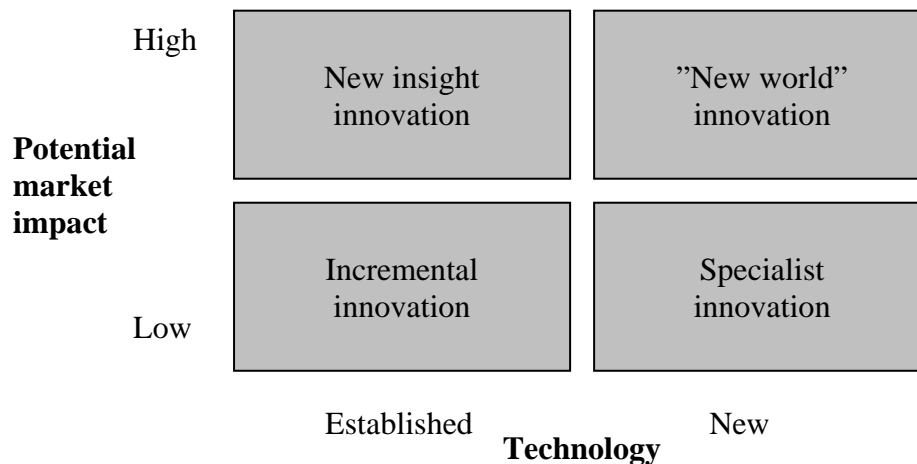


Figure 2.1 Types of entrepreneurial innovation (Wickham, 2006)

In addition to the classification above, it is possible to elaborate on various specific types of innovations which can be identified in a business environment. Table 2.1 (next page) shows another typology of innovations. Once again we should mention that an innovation does not have to be a tangible physical object or include physical changes but can just as well be the adoption of new management techniques or different types of services.

Types of innovation	Examples
Product innovation	The development of a new or improved product
Process innovation	The development of a new manufacturing process
Organisational innovation	A new venture division, a new internal communication system, introduction of a new accounting procedure
Management innovation	TQM (total quality management)
Production innovations	Quality circles, just-in-time, manufacturing systems, new production planning software, new inspection systems
Commercial/marketing innovation	New financing agreements, new sales approaches
Service innovation	Internet-based financial services

Table 2.1 Different types of innovations (Trott, 2005)

2.4 The process of establishing new businesses and industries

Establishing a new business is a time consuming activity and requires some basic skills. Based on the growing focus on entrepreneurial activity, many books and manuals have been produced with the aim of aiding the entrepreneur in the process. Kubr et al.(2004) describes the steps in the process of establishing a new business, starting with the business idea. All corporations started with someone having an idea of how to do business. The business idea is described as the first step in building a viable business. By compiling data and examining some basic facts, the entrepreneur is more qualified to evaluate whether the business idea is viable or not in the long term.

Some researchers emphasize the new and innovative idea (Spilling et al., 2006). The idea is followed by the start-up and the growth cycles. Before the idea is materialized in the form of a new company, there are many challenges that need to be addressed. The business idea as such is not necessarily worth anything if the entrepreneur is unable to refine the idea and transform it into a business venture. A tool to help the entrepreneur in this process is the business plan. A business plan is by Kubr et al. (2004:55) defined as a report/work document that is gives clear and concise information about all sides regarding a new business that is relevant for the investors, such as information about the business idea, the market, management team and leadership, prospects and commercial analysis, etc.

Spilling (2006) underlines that the plan should be shaped to reflect the needs of the venture it represents, i.e. the plan should reflect and take into account the information needed by the relevant audience. A new venture may need to attract investors to help with the funding of the new business; their need for information is quite different from the informational needed by customers. By finishing a business plan, the entrepreneur has taken into account the foreseeable risks and opportunities involved in starting up a new business.

Figure 2.2 illustrates how the accumulated cash-flow normally develops from business set-up and until the product is established in the market. The coloured area illustrates the phase when the expenses are higher than income from sale of the product, also known as the “bloodshed” period. As revenue hopefully increases, the accumulated cash flow is turning positive. Nevertheless, a great number of innovative ideas never reach this stage because of poor funding, bad planning or simply mismanagement (Hovland, 2006).

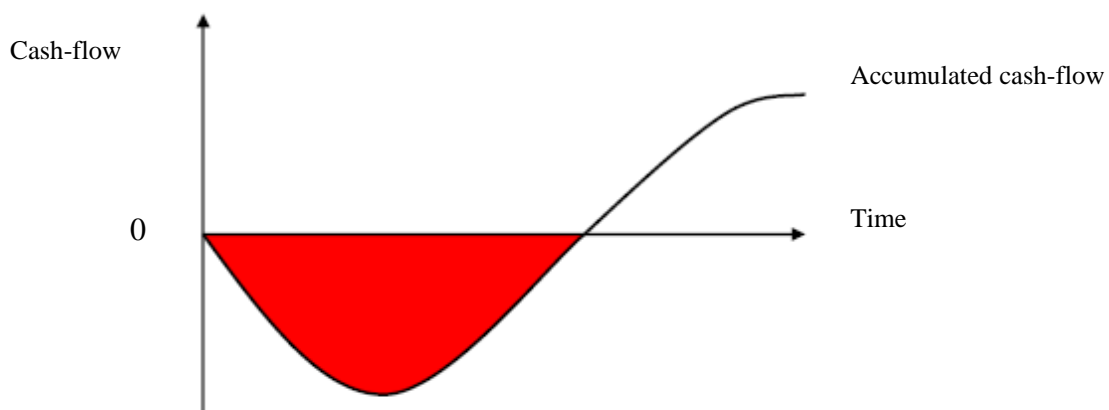


Figure 2.2 Illustration of the “bloodshed” phase in the cash-flow of a new enterprise or business (Hovland, 2006)

The exercise of developing a business plan is basically about identifying preconditions for and barriers to a business creation. Such barriers are often described as “barriers to entry” and may be defined as “*attributes of an industry’s structure that increase the cost of entry*” (Barney, 1996). A barrier to entry is one of the five forces in the framework that Michael E. Porter has developed for industry analysis and business strategy development. The other four forces that dictates the industry’s ability to make profit is rivalry, supplier power, buyer power, and the threat of substitutes. By rivalry Porter refers to the industrial competition, i.e. the way the companies compete with each other, especially on price. Supplier power and buyer power has to do with their ability to set the terms of trade, which again hinges on all the

actors' opportunities to do business elsewhere. Substitutes are about the costs of switching to an alternative product (Wickham, 2006).

A new business venture sometimes implies the inauguration of a new industry. New products and new markets are created and the set of relevant producers are conceived of as a separate entity. This seldom occurs. Usually an entrepreneurial venture represents a product line extensions or new platform development that either introduces new products to existing customers or tries to sell existing products to new customers.

Building a new industry means developing a new pattern of recognized specialisation. This process is based on individual entrepreneurs distinguishing themselves from other business actors. At the same time a new infrastructure is needed to support the industry. The business niche can only be sustained by the development of specialised inputs, routines, standards, organization, etc. Hence, the creation of a new industry depends upon the actions of numerous others to support the process. It is the aggregated effort of all entrepreneurial firms and outside partners that builds niches of commercial enterprises (Johnson & Van de Ven, 2002). The outcome of this process is a new configuration of activities which might be conceptualized as an innovation system.

2.5 Is blue mussel farming in Norway an entrepreneurial activity?

The Norwegian farmers of blue mussels were no pioneers. Mussel farming has long traditions in countries such as Spain, the Netherlands and Italy. The technology applied in Norwegian blue mussel farming is basically imported from countries like Italy, New Zealand and Spain (Hovgaard et al., 2001). This means that the development of blue mussel farming in Norway can be seen as a geographical expansion of an already established industry.

None the less, the Norwegian farmers have run into many problems. The series of failures confirm this. The existence of an industry in some other countries is obviously no guarantee for easy success. The Norwegian farmers had no fixed recipe they could follow. The domestic industry could not rise as a blueprint of foreign industries.

Henrekson (2007) defines entrepreneurship as individuals and organizations that contribute to renewal and change in the economy. He defines entrepreneurial action as creation of an

opportunity as well as a response to circumstances. This demands that an entrepreneur has the motivation and the willingness to embrace risk.

Based on this definition, the Norwegian blue mussel farmers are responding to the natural potentials existing along the Norwegian coast. They use these opportunities for setting up new businesses. Their entrepreneurial activities include adapting existing technology to local conditions. But in order to develop a new business they have to do a lot more. They must mobilize capital for investments, learn how to run operations efficiently, deal with unexpected events, etc. Moreover, the market must be defined, reachable and willing to pay a sufficient price to the producers. The entire infrastructure supporting the industry also needs to be built and put in place. As pointed out by Johnson and Van de Ven (2002), new industries are rarely created in isolation by single individuals. They need support from other industries, financial institutions, government agencies, and education and research institutions. The Norwegian blue mussel industry is thus a good example of the complexities involved in building a new industry.

Interesting parallels can be drawn between the Norwegian blue mussel industry and the Norwegian salmon farming industry. Here the pioneers got inspiration from Denmark who farmed rainbow trout. This technology was adapted and developed to fit salmon and Norwegian conditions. Instead of using land-based ponds they started with net cages in the sea. The industry evolved through a bottom-up process of local experimentation and entrepreneurial initiative. The entrepreneurs were fishermen and others carrying out salmon farming as an experienced-based, sideline activity (Aslesen, 2007).

Blue mussel farming in Norway is still in a phase which resembles the early stages of the salmon farming industry. Consequently, the current industry has a strong element of entrepreneurial activity.

3 Methodology

To answer scientific questions we need procedures and techniques that can guide our way. In research, it is not sufficient to trust instincts and capability. One also needs knowledge of the methods and techniques available to a scientist (Ringdal, 2000). Scientific method is what makes scientific activity a good craftsmanship (Halvorsen, 2008). In this chapter I will sketch out the methodological foundation of this thesis and explain some of the choices I have made.

3.1 Quantitative and qualitative research

In social sciences it is common to distinguish between qualitative and quantitative research. Qualitative research aims at gathering in-depth understanding of human phenomena, while quantitative research involves the systematic investigation of their quantitative aspects and relationships. In qualitative research the scientist tries to understand the reasons for behaviour. Hence, he or she must study reality as it appears for the person or persons studied. In quantitative research, which concentrates on numbers and mathematical expressions, the scientist can keep a bigger distance and pay less attention to the informants' perspective (Thagaard, 1998). Qualitative research tends to have an exploratory character. Quantitative research is more preoccupied with developing theories and testing hypotheses.

I have chosen to use a qualitative approach in this thesis. Figure 3.1 highlights the differences between a qualitative and quantitative research design. The design of a study is the result of several decisions. A basic decision is the choice between quantitative and qualitative design and method.

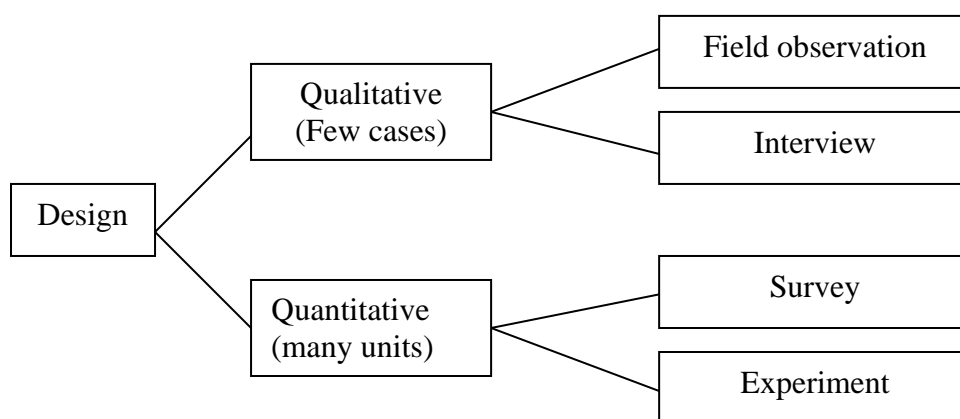


Figure 3.1 Decisions regarding design of study (Ringdal, 2000)

There are some major differences between quantitative and the qualitative research. These differences are highlighted in table 3.1. Most are related to the fact that the researcher is working with different kinds of data in qualitative and quantitative research. One major difference is the fact that quantitative studies are based on what can be described as “hard” data. These data appear as indicators which can be measured in such a way that they are suited to be counted, in contrast to the qualitative study where the data are “soft” and appears as texts which has to be processed and interpreted. These data are not suited to be analyzed by counting (Johannessen et al., 2002).

	Qualitative approach	Quantitative approach
Type of data	Qualitative (soft) data, such as texts (or picture or cuts of sound) which highlight theoretical “variables” or theories	Quantitative (hard) data, theoretical variables are converted into operational variables which can be measured by numbers or by converting the information to number codes
Flexibility	Great	Relatively small
Data analysis	Interpretation Ongoing process integrated with the data gathering	Counting After gathering the data
Benefit beyond the actual research	Transferability	Statistical generalization

Table 3.1 Features of qualitative and quantitative research approaches (Johannessen et al., 2002)

In this thesis I am applying both approaches. On the one hand, I rely on available statistics to draw a general picture of the blue mussel industries in Norway and Canada in terms of production, value creation, number of shellfish leases, etc. On the other hand, I have set out to capture the opinions of local blue mussel farmers in the two countries. Before I started working on this thesis, I had been talking with blue mussel farmers in Norway. They voiced the opinion that Canadian authorities were much more supportive towards their industry than was the case in Norway. Hence, I wanted to find out if this was correct. My intention was to get an overview of how the blue mussel entrepreneurs in the two countries are working together with the authorities to solve challenges and what kind of government conditions that applies in the two countries. When starting up this project, the main idea was to get knowledge of the working conditions in the two countries and investigate if something could

be done in a different manner towards the industry in Norway. This favoured a qualitative design.

3.2 Research question

The key in any research process is to conceptualize the problem in an appropriate way and to formulate an accurate research question. This will help accomplishing the rest of the research project (Halvorsen, 2008). A research question can be formulated as a question or a hypothesis, and the success of any research project is often dependent upon finding an interesting and original research question (Ringdal, 2000).

The research question also indicates which persons or situations you chose to study, what method to be used and how the analysis is going to be conducted. The research question is not finished when the researcher is collecting data but is revised and reformulated as an ongoing process throughout the entire research project. Research is also characterized by its inductive way of analysis. The term inductive is today used to show how one can generate theory from data. Furthermore, inductive analysis is to investigate similarities and dissimilarity among cases and thereby being able to develop concepts (Mehmetoglu, 2004).

This is how I decided to work with my thesis. It was difficult to formulate a research question at the beginning of the work but I had an overall understanding of the field and was able to put down some lines regarding the theme. This helped me acquire more knowledge about the issues and to formulate a better research question.

3.3 Case study

Based on my research question and the type of thesis I wanted to write, I chose to do a case study. By carrying out a case study, there are two key criteria: a delimitation of what is included in the case and a thorough description of the defined case. In short terms, a case study is to gather a lot of information, or data, regarding a limited phenomenon, i.e. the case (Johannessen et al., 2002). Mehmetoglu (2004) mentions that a thorough collection of data renders possible the study of several different cases.

A case study is normally carried out by using only a few units in the research. The selection is done for analytical purpose, not for the purpose of generalization. The process or how something is developing is the point of interest, and a case study makes it possible to collect data for a series of variables (Halvorsen, 2008).

This suited my work because of the need to explore the possible differences between the Norwegian and the Canadian mussel farmers and also the government support system in the two countries.

Mehmetoglu (2004:42) quotes Merriam (1988) and the four different main characteristics of the case study: particular, descriptive, heuristic and inductive. Particular is a case study that focuses on a special occurrence, situation or phenomenon. Descriptive is a way of explaining by detailed descriptions of the phenomenon that is studied, while the heuristic case sheds new light over a phenomenon and gives the reader a new understanding of the theme by generating new knowledge of it.

This thesis has a more descriptive character as it aims to reveal both similarities and differences between the blue mussel industries in Norway and Canada.

Mehmetoglu (2004:43) quotes Yin (1989) who states that there are three different types of case studies: the exploratory, the explanatory and the descriptive. Exploratory studies are often used as a preparatory work before a more thorough study. They are also used as a typical case design as preparatory work before the two others (Ringdal, 2000). Explanatory studies are used to conduct a causal study, while the descriptive case study is based on the researchers' descriptive theory which is used as a theoretical framework throughout the study. (Mehmetoglu, 2004).

In addition to being descriptive, my work is also exploratory because it is in many ways based on a new way of working towards the blue mussel industry. The research question was prepared before the interviews of the mussel farmers began.

The traditional meaning of comparative design is multicultural surveys where two or more countries are compared. The core in comparative design is to find theoretically interesting clues by contrasting two or more cases in space or time. Such cases may be families,

organizations, companies or communities (Ringdal, 2000). This thesis focuses on people in different companies and government agencies in regions in Norway and Canada.

3.4 Data sources and data collection

In research, collecting data is a necessary part of the process. There are two types of data that can be used as a basis for the analysis: primary and secondary data. Primary data is original information collected by the researcher himself. Secondary data is information which is already prepared and made available by others. This can be anything from documents to statistics published by, for instance, Statistics Norway. Secondary data comprises process data, bookkeeping data and research data (Ringdal, 2001).

In most cases there is a considerable cost associated with gathering primary data. The advantage of secondary data is that they usually are ready-made, easily accessible and for free. On the other hand, because secondary data might have been produced with other purposes in mind, the researcher might experience that some key elements are missing. It might also be difficult to detect and discover sources of error because the data has been collected by others (Ringdal, 2001).

This work uses a great deal of secondary data. The FAO database on world fisheries has been useful in getting an overview of the world production of blue mussels. Statistics Canada and the Department of Fisheries Canada gave me insight in the Canadian blue mussel farming. The Norwegian figures are mostly from the Norwegian Directorate of Fisheries and the Norwegian Seafood Export Council. These data gave a picture of how the blue mussel industries have developed in Norway and Canada and also how the development has been in different provinces and counties in the two countries. One challenge I encountered was that statistics from the two countries are not always commensurable.

However, the core of the thesis is the primary data collected from both Norway and Canada. By using interviews as primary data, I could shape the questions to fit my thesis and I was able to obtain first-hand data relevant for my research question.

3.4.1 Interview guide

There are two main types of interviews; the structured and the unstructured. In between these two types there is a third one, the semi-structured interview, which is probably the one mostly used. This third type is based on an interview guide, but the guide is more a list of questions and general themes to be covered through the conversation with the respondent (Thagaard, 1998).

This thesis is based on a semi-structured approach. I prepared a list of questions before a conducted the interviews. The list was used as a guideline throughout the interviews. In advance, I had a clear idea of what subjects I wanted to cover in the conversation and it was important not to forget any of those. However, during the interviews I discovered that the order of the questions that I had prepared did not matter. Often the respondent answered my last questions in the beginning of the interview as the themes were closely related.. I started by asking some general background questions and proceeded by asking the respondents why they had started with blue mussel farming, the problems they had encountered, and the support they had received from the government. The same procedure was used when I interviewed the different organizations.

The interview guides are included in appendix 1 (blue mussel farmers) and 2 (organizations).

3.4.2 Sample

In my case I could not reach the total population of concern, i.e. all the blue mussel farmers in Canada and Norway. A selection had to be done. There are many sampling methods that can be employed. Sampling is normally divided in two categories: probability sampling and nonprobability sampling. In this study the selection was rather arbitrary and based on convenience.

The sample of the survey is the blue mussel farmers who had the opportunity to meet me when I was in Canada. I had a plan of going to Canada and do the interviews face to face with the Canadian respondents. The main reason is that it is difficult to do phone interviews with people in a different country as long as you do not know them or never have met them before. However, the particular week I had set aside to the trip was also the week when the seafood fare in Brussels was held. This influenced the sample of respondents as many of them were attending the fare. Nevertheless, I managed to get some appointments and felt safe that it was

worth doing the trip. I was only interviewing active blue mussel farmers. The government representatives had to be engaged with the blue mussel farming industry in some way. Because of the problems to get in touch with a sufficient number of farmers, it was difficult to set other criteria, such as sex and age, to be a part of the selection.

It is my opinion that the blue mussel farmers I interviewed were a fairly representative selection of the blue mussel farmers in the different regions. Regarding the different organizations, I chose some which were important to the blue mussel industry in Canada and in Norway. Some were working towards the industry at a regulative level and some at a supporting level, working on conditions and financing of the industry.

In Norway I interviewed blue mussel farmers in the counties of Sogn og Fjordane and Sør-Trøndelag. I used the Norwegian Directorate of Fisheries' database of aquaculture leases to find possible candidates and contacted them by mail or phone. I decided that three in each county would be sufficient. Otherwise the amount of data would be overwhelming.

Some governmental agencies and membership organizations in Canada and Norway were also interviewed. These were picked out from their contact with the blue mussel business and the fact that they had a function towards the industry. Due to time constraint, the Norwegian Directorate of Fisheries was not interviewed.

3.4.3 Carrying out the interviews

Because of the difficulties regarding the Brussels seafood fare, I got help to get in touch with blue mussel farmers and persons from the federal and provincial level in Quebec, Prince Edward Island and Nova Scotia. All of the interviews were recorded by using a laptop and a sound recording software. All the respondents agreed to the interviews being recorded. This made it easier for me to pay attention to what was said. I did not have to write down the answers on paper during the interview. Using a recording system also secured a more accurate reproduction of the answers. The last interview in Canada was done by phone, due to time constraints. This was much more demanding as I had to write down the answers while the respondent talked.

The length of the interviews varied from a half to one hour. Some of the respondents had more to share than others. I also discovered that I could not use the structure in the interview guide in all the interviews as some of the respondents linked their answers to other questions on my interview guide. I had to pay attention throughout the interviews and be aware of this. The respondents were good at supplementing answers and any concerns towards the interview situation being a question-answers session were groundless. All of the respondents seemed relaxed and gave good answers to my questions.

The interviews in Norway were carried out by phone in speaker mode and the same equipment for recording the sound as in Canada. This worked well with generally good answers. It was easier to carry out the interviews by phone in Norway. I knew some of the respondents already and this created a relaxed atmosphere in the interview situation. I had booked time with them in advance to secure that they were available and concentrate on the interview. Prior to starting the interviews I informed the respondents that the information they gave me would be treated anonymously in the thesis. As the blue mussel industry is a fairly small business, this was important to clarify.

3.4.4 Transcription

The transcription process took time. I used the sound recording software to play the interviews and I had the opportunity to stop and rewind word by word when there was something that I did not understand in the recording. Some of the interviews were with people from the Quebec region in Canada and their English has a French accent. This often made it difficult to understand some words. Nevertheless, I could catch the meaning of their answers. I also had a couple of interviews where the quality of the sound was not too good, but by using different editing and amplifying techniques, I got a good transcription of these interviews as well. When there was something that I could not understand from the tapes, I noted this in the transcription. I spent about three hours transcribing each interview.

3.5 Analysis

Analysis of data is by Halvorsen (2008:176) defined as: *categorizing collected data with the purpose of describing the findings* (translated from Norwegian). The first thing the scientist has to decide when analyzing the collected data is what is to be considered relevant. At first

glance, the amount of data might seem overwhelming and over-complex. The same themes can be covered and described several different places in an interview and there can also be great variations in how much each respondent is responding to each question and theme. Because of this, the data has to be arranged in a way that gives an overview and a basis for insight (Thagaard, 1998).

When it comes to analysing qualitative data, it is a time consuming process, as the qualitative data is presented as unstructured information. The analysis is based on notes from fieldwork or transcribed interviews. Qualitative analysis tends to be more personal as it is often the same person who carries out both the data collection and the analysis (Halvorsen, 2008).

Text analysis consists of two main types, the *overview analysis* and *the partial analysis*. Both require an effort aiming at order, structure and overview in an unstructured text material. A prerequisite for using the partial analysis is that the interview can be divided into different statements which are countable and possible to categorize. Apart from statements it can also be opinions and particular attitudes that occur in the text. In general, it is important to show the content of the meaning to the reader and also to clarify the context in which the statements are made. This can be done by quoting the transcriptions from the interview. On the other hand, the reader can have a hard time knowing how representative such statements or quotes are (Halvorsen, 2008).

One way of carrying out an overview analysis is to develop a general impression of the interviews by reading them. Having looked over and read the interviews, it is possible to pick situations or quotes which illustrate the main point. By using this method, it is possible to reach a situation where the complexity and variation in a social phenomenon is omitted out. It is therefore advised to use a combination of the two methods (Halvorsen 2008).

The overview analysis was chosen as technique when I analyzed the interviews. I found this to be best suited to the interviews I conducted, as I had a lot of material and was searching for similarities and differences between government agencies and companies in the two countries. I made a table with all the answers, focusing on key points. This made it easier to look for similarities and differences among the respondents in the two countries. The table became large at the end of the work and the answers were sometimes difficult to categorize. Because of this I had to use the transcriptions, too, in the process of analyzing the questions. In the

analyzing process, the table was merely used as a tool to find the first clues of similarities and differences before I worked more thoroughly by using each individual transcription.

3.6 The quality of the research design

In quantitative research validity and reliability are key concepts in order to test the quality of the research results. These criteria are less relevant in qualitative research. According to Mehmetoglu (2004), qualitative research must be judged on the basis of credibility, dependability, confirmability and transferability.

3.6.1 Credibility

Credibility means that the research is conducted in a confident manner (Thagaard, 1998). Each step of the research process is closely linked to the credibility of the result, and the approach, analysis, interpretation and the report all influence on the finished result. The researcher has to recognise that the process is reflexive, meaning that his or her personal values and interests will influence the entire process. As in quantitative research, it is a challenge to conduct plausible interpretations of the collected data (Halvorsen, 2008).

The researcher has to be able to reflect on the value of the information supplied by the respondent and in what context the data was collected (Thagaard, 1998). It is also possible to increase the credibility of the research by spending longer periods in the field where the data is collected. It is advised to discuss the results and findings with colleagues or competent people who are not involved in the research process. This prevents the researcher from getting too close to both the data and the sources (Mehmetoglu, 2004). In other words, the researcher has to make the results credible by taking these factors into consideration in the work and also show that it is incorporated in the interpretation of the analysis.

I had one week during which I could perform the interviews in Canada. I also had limited time to conduct interviews in Norway. This ruled out spending more time with the informants and respondents. On the other hand I have prior knowledge of the blue mussel industry from my work and I know the Norwegian industry fairly well. The reason is that I am currently working for Innovation Norway in the county of Sogn og Fjordane. This can be both an advantage and a disadvantage. I am aware that I may be prejudiced on some matters and that

my personal opinions could influence on the interpretation of the data. Therefore I have been careful in drawing conclusions and have been critical on how I have interpreted the data.

The fact that I have met some of the informants through my work may have influenced how they answered my questions. However, this was only relevant in Sogn og Fjordane. My impression was that the informants did not hold anything back. They gave direct and honest answers, even when it came to difficult issues. As I analyzed the interviews, I noticed that several of the respondents had some positive remarks on their experience with Innovation Norway. This could be based on the fact that they had such positive experience or it could be due to the fact that they knew I was working there. I tried to have this in mind when I analyzed the results, but the reader should be aware of this.

I recorded each of the interviews and did a word by word transcription and thereby minimized the danger of losing input and getting the wrong interpretation. In the analysis I chose to include some quotes based on the answers from the respondents. Regarding the Norwegian respondents, I had to translate these quotes into English. This may in some cases alter the order of words and the building of the sentences. It is difficult to translate word by word from Norwegian to English. I tried to concentrate on the main message and did my best to translate the sentences so that the meaning did not get altered or lost.

3.6.2 Dependability

Dependability is the reliability in quantitative research. According to Mehmetoglu (2004) it is possible to achieve the goal of dependability in the qualitative research by using a technique called auditing. Evaluating the process of collecting data, interpretation of categories and concepts and the process of selecting respondents, should according to this theory make it possible to evaluate the researchers documentation and how the data are presented. The point is to make the reader understand how the researcher has reached his conclusions. Johannessen (2002) mentions two different ways of conducting a test on the dependability of a research project; by after a while repeating the research yourself on the same group of people or by letting other scientists do research on the same phenomenon. If they reach the same results, the research then has high dependability.

There was no opportunity to involve others in research based on the same hypothesis. Nor was there an opportunity to go back and do several interviews after some time. Therefore the dependability has been secured by giving a thorough description of the process and to be critical towards my work and giving comments when I felt there were issues that could impact on the result.

3.6.3 Confirmability

Confirmability equals the criteria of objectivity in quantitative research. By having a critical point of view towards his own interpretations and getting the results of the research confirmed by others, the researcher can maintain the confirmability of the results (Thagaard, 1998). The researcher can also get feedback from the respondents on his or her interpretation (Mehmetoglu, 2004).

As mentioned before, I had some knowledge of the blue mussel industry in Norway before I started on this research project. In many ways this was also the reason why I chose to study this subject. When I conducted the interviews I tried to be careful not to direct the conversation in a specific way, but to let the respondent talk freely. When I conducted the interviews in Canada, there were some situations where respondents expressed interest in how things are done in Norway. In those cases, I tried to answer as neutral as possible.

3.6.4 Transferability

In qualitative studies it is the interpretation of the data that is the foundation of the transferability, not the description of the patterns in the data (Mehmetoglu, 2004). The transferability of research is a measure of how results can be given meaning outside the setting of the initial research. Interpretations, explanations, terms and mechanisms can be useful in contexts outside the specific research and in other research projects. To differentiate the qualitative research from the quantitative, the term transferability is used instead of the term generalization, as generalization gives associations to statistical generalization (Johannessen, et al., 2002).

I was interested in investigating the bottlenecks and barriers that blue mussel farmers in Norway and Canada had faced. I did not use any statistical tools in choosing the respondents

and the result can not be generalized. However, I was looking for similarities and differences when I was analyzing the answers. I believe that the results are fairly general for the industry in the different regions in the two countries. As there was some delay between the interviews in Canada and Norway, some of the respondents in Norway did refer to the financial crisis in their answers. This was not an issue when interviewing people in Canada: Hence, they might answered differently if these events had occurred prior to my visit.

4 Blue mussel farming in Norway and Canada

This chapter compares the development of the blue mussel industry in Norway and Canada, by specifically examining the farming systems, the producers, how the industry is organised and the technologies and methods employed.

4.1 Farming systems

The Norwegian blue mussel industry is based on industrial farming of the mussels. 70-80% of the world wide production is produced by farming. Some countries are using other methods, such as Denmark, where they harvest wild mussels, and in The Netherlands where they harvest and replace spat into deeper waters for further growth (Hovgaard et al., 2001).



Figure 4.1 Map of Norway

The conditions for growing blue mussels along the Norwegian coast are considered to be good. Fjords and protected waters along the coast are well suited for blue mussel production, but is also demanding in the way that the blue mussel farmers have to adapt to different local conditions. This can be seen as a disadvantage, however it allows the growers to adapt different techniques and strategies and they should therefore be able to serve the market through the year (Hovgaard et al., 2001).

As in Norway, blue mussel production in Canada is based on farmed mussels. Most of the industry is located on the Prince Edward Island, but mussel farms are also operated on the Newfoundland, Labrador, New Brunswick, Nova Scotia, Quebec and British Columbia (Western Canada) (Fisheries and Oceans Canada, 2003).



Figure 4.2 Map of Canada

On Prince Edward Island, the blue mussel is the single most important aquaculture species. The major growth in the industry has occurred since 1990.

The climate is quite different between the Canadian provinces where blue mussel growing is taking place. Newfoundland has a sub arctic climate with ice covering the bays in the winter months. Quebec and Prince Edward Island has a more temperate climate, but the waters are covered with ice in the winter. British Colombia is more temperate and oceanic.

In the gulf region of Canada virtually all mussels are grown by using the suspended long line technique. The suspended long line system was developed in the 1970s and commercial growers started using this technique in 1981, because this gives the best quality and meat to shell ratio (Fisheries and Oceans Canada, 2003).

The long line system has also proven to give most production per unit area (Policy and Economics Branch, 2006).

4.2 Producers of blue mussels

It is the Ministry of Fisheries and Coastal Affairs, through the Directorate of Fisheries, which issues the licences to blue mussel farming in Norway (Fiskeridirektoratet, 2007). As of February 2008 Norway had a total of 524 commercial blue mussel licences and most of the coastal counties have blue mussel farming activity. In 2008 the county of Nordland had 174 licences, Vest-Agder 12 and Sogn og Fjordane 54 (Fiskeridirektoratet, 2008), see figure 4.3.

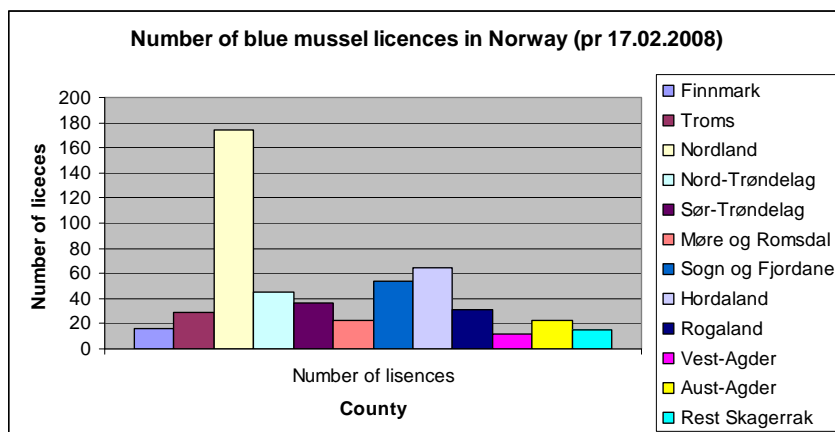


Figure 4.3 Blue mussel leases in Norway, distributed by county (Fiskeridirektoratet, 2008)

The number of blue mussel farming companies in Norway is less than the number of licences. Some of the farming companies have several licences. These are either gained by application to the Directorate of Fisheries, bought directly from farmers who have opted out of the industry or from banks and other creditors due to the situation in the industry the last years. However, the industry is characterized by several minor producers.

Until recently processing plants existed in all of the counties in the western part of Norway (Rogaland, Hordaland, Sogn og Fjordane and Møre og Romsdal), but none of these have been

successful. Several plants have been through periods with financial problems and bankruptcy due to small volumes of mussel, algae problems, bad quality and low prices on the products. There is no value-adding taking place in Norwegian production. Most of the export of blue mussels is in packages over 25 kg, but to some extent also in smaller packages (i.e. Modified Atmosphere, MAP) (Sandberg et al., 2007).

In addition to the processing plants mentioned above, several others have been established in other parts of Norway, but there are currently no statistics on how many of these are still in operation.

In Canada, The Department of Fisheries and Oceans (DFO) is a federal agency responsible for ensuring sustainable development of the aquaculture industry. In Prince Edward Island, the DFO is responsible for aquaculture leases, via an agreement from 1928, which was reconfirmed in 1987. The mission of DFO is: *To manage Canada's oceans and major waterways so that they are clean, safe, productive and accessible. To ensure sustainable use of fishery resources and facilitate marine trade and commerce* (Department for Fisheries and Oceans, 2005). Prince Edward Island is in fact the only province in Canada where federal government is responsible for issuing leases and licences in waters which are under provincial jurisdiction (Lanteigne, 2002).

New Brunswick signed a memorandum of understanding with DFO in 1989. It affirms that the New Brunswick Department of Agriculture, Fisheries and Aquaculture (DAFA) is responsible for the administration of aquaculture licenses and leases.

The province of Nova Scotia has passed its own aquaculture act, established regulations and appointed a provincial aquaculture coordinator. A memorandum of understanding has been signed with the DFO, which is affirming that the administration of aquaculture licenses and leases in Nova Scotia is the responsibility of the Nova Scotia Department of Agriculture and Fisheries (Fisheries and Oceans Canada, 2003).

When it comes to issuing leases and the lease application process, most mussel lease applications demand a formal assessment under the Navigable Waters Protection Act (NWP) and under the Canadian Environmental Assessment Act (CEAA).

The Federal Government is also assessing the impact of proposed aquaculture sites, regarding questions as native rights and land climes, migratory birds, utilization by other stakeholder groups, shellfish food safety, protection of fish habitats and the prevention of pollution (Policy and Economics Branch, 2006).

As shown in table 1.3, Prince Edward Island had most of the issued mussel leases in 2001. It was estimated that 90% of the sites which were considered suitable for mussel culture and met the criteria already were leased. Most of the leases on the Prince Edward Island are found on the northern and eastern shore. The low number in Eastern New Brunswick is because mussels are not the primary specie cultured and mussel sites were also involved in growing oysters. In the Gulf of Nova Scotia, almost all licences are located in the Tatamagouche bay (Policy and Economics Branch, 2006).

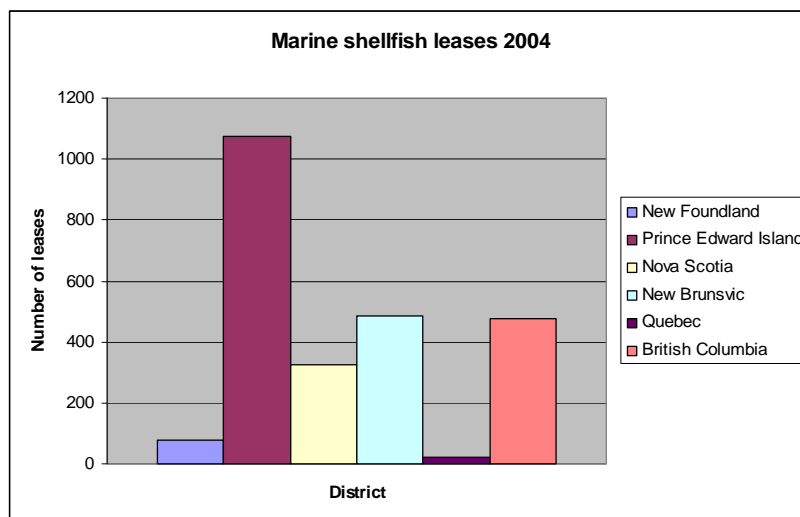


Figure 4.4 Marine shellfish leases in Canada, issued by area 2004 (DFO, 2005)

Most of the leases are found in Prince Edward Island. In 2004, the 302 mussel leases in the Prince Edward Island were held by 142 leaseholders. Eastern New Brunswick had six commercial mussel aquaculture operations in 2001, of which three were of a larger scale. In the gulf of Nova Scotia, the 8 mussel licences were held by two individuals and 4 companies.

4.3 Organization of the industry

Some farmers are members of the Norwegian Seafood Federation (FHL), which is mainly organizing the Norwegian salmon farmers. However, more members from the shellfish and

mussel industry are now joining FHL and FHL has established an own sector group for this branch (Solsletten, 2008b).

In some counties in Norway mussel farmers have started their own organizations, working for their interests and cooperation between their members. Promoting the members' interest towards governmental bodies is also a key element for their existence, but the level of activity within these organizations varies.

It is the individual shellfish grower's responsibility in Norway to check mussels for biotoxin such as DSP or PSP before delivering mussels to processing or export. A sample taken from the stock is shipped to a certified laboratory and - depending on the result - the grower is given a window of seven days to complete the harvest.

Canadian Aquaculture Industry Alliance is a national industry alliance association and represents the interests of the Canadian aquaculture operators. The organization was founded in 1995 and comprises local shellfish organizations (Canadian Aquaculture Industry Alliance, 2008). Prince Edward Island Aquaculture alliance (PEIAA) was formed in 1998 and consists of PEI Cultured Mussel Growers Association, Island Oyster Growers Group and the PEI Finfish Association. PEIAA has approximately 130 members (Prince Edward Aquaculture Alliance, 2008).

One distinct difference between Canadian and Norwegian blue mussel farming is that the Canadian government is running a program to guarantee the quality of shellfish prior to export. This dates back to 1948 when Canada signed an agreement with the United States. The standards from this agreement form the basis for the Canadian Shellfish Sanitation Program. The programme is run jointly between Environment Canada, the Department of Fisheries and Oceans and the Canadian Food Inspection Agency. The Canadian Shellfish Sanitation Program ensures that molluscs and shellfish are harvested from areas meeting approved federal water quality criteria. Waters where there is mussel farming is monitored. The Department of Fisheries and Oceans has the power to close shellfish growing areas where the water quality is not sufficiently good. The management of the marine biotoxin programme is the responsibility of the Canadian Food Inspection Agency.

4.4 Farming technology and method

Blue mussel larvae are swimming as plankton in the summer. By placing spat collectors into the sea, most of the Norwegian blue mussel farmers are able to collect abundant amounts of spat. However, local variations from site to site occur (Winther et al., 2006).

Normally the spat attaches to the collectors from one meter below the surface and further down. A trial collector can be used to get an overview of when the spat is fastening to the collector in the actual location. The trial collector is lifted up in September-October and the depth, density and size of the spat is registered. A good plot should give a fair amount of spat with a size of more than two centimetres (Hovgaard et al., 2001).

The Norwegian blue mussel farming is based on the long line culture system, which is the most recent development for mussel culture. Subsurface long lines were developed in France, with the purpose of resisting storms and tidal currents. Norwegian growers are using multi long lines, often 7-9 long lines which allow a larger crop. An important part of this growing technique is having control with the buoyancy on the ropes. Float is connected to the submerged horizontal lines. The submerged horizontal lines support a large number of vertical ropes, which is where the mussels are grown (FAO: 4).

Based on experience or the trials with the spat collectors, farmers know when they need to connect the spat collectors to the long lines. In Norway this is normally done between April and June. Continuous collectors are preferred as they are easier to handle in a mechanized way when the blue mussel spat is going to be harvested and graded (Hovgaard et al., 2001). The collectors can be made of different types of materials as rope or band made out of fabric. Most farmers now use rope and have moved away from the fabric band type.

One criterion for selecting the type of material for the collector is whether the farmer is going to re-seed the spat or not. If the farming of blue mussel is going to take place without re-seeding, the collector must allow the mussel to be strongly attached to the rope to prevent it from sliding down the rope when they grow bigger (Hovgaard, et. al., 2001).

If the farmer is using thinning as a strategy, this work should start up in October. One of the key elements to the growth of the blue mussel is the access to enough algae to feed from. Too

many blue mussels attached to the ropes will constrain the growth of the mussels, and this result in an uneven size of mussels. When harvested, as much as 30-50 percent of the shells have to be separated from the batch because they are smaller than demanded. If the mussels are thinned and sorted into three sizes, the outcome can be as high as 90 percent (Hovgaard, Duinker & Hovgaard, 2005). Thinning and re-socking is an important step in the production process because it gives the mussel farmer an oversight of the crop and helps raise the quality of the mussels (Winther et al., 2006).

Most farmers are now adopting socking as a method of thinning the mussel spat. The socks can be made out of fabric that does not biologically degrade in the sea and allows the mussel to move through the meshes and fasten on to the outside of the socking. This method is mostly used in Canada and Italy. The other type of socking is made out of cotton, which decomposes after a few days in the sea. A core rope in the sock gives the mussels a substrate to fasten themselves to and gives good support for the byssi threads. This method is used in New Zealand and Spain. Of these two methods, the last one is most compatible to mechanised socking equipment and is used in Norway (Hovgaard et. al., 2001).

In the gulf region of Canada virtually all mussels are grown by using the suspended line technique (Fisheries and Oceans Canada, 2003).

Most of the growers collect their own seed and some opt for a second licence to collect their own seed. Different types of materials are used for the seed collectors attached to the backline, and hung out in the spring or early summer, just before the spat is expected to settle. Seed collection in PEI is usually done in the upper reaches of inlets or rivers, these areas are unsuitable for grow-out operations because they are shallow. (PEI Department of Agricultural, Fisheries and Aquaculture, 2003).

The spat grows on the collectors until they reach a size of about 15 mm, then the spat is removed, de-clumped and graded to remove the small seed. The seed is then transported to grow-out units where the mussels are loaded into socks.

Socking refers to the operation by which seed mussels are filled into socks or mesh sleeves and the technique is widely used in the Canadian blue mussel farming. Density is usually of

120 or 140 seed mussel per foot of sock. The sock is a mesh tube, often strengthened with a strand of polypropylene twine, is approximately 40 mm wide and between 2,5 to 3 meters in length. This though depends on the conditions on the plot (Policy and Economics Branch, 2006).

An average mussel sock holds between 15-30 kilograms of mussels once the mussels reach a commercial size. The growth period takes about 18 to 24 months and the mussels are harvested by use of special vessels equipped with hydraulic winch systems.

Some of the Canadian plots are covered with ice in the winter months. The growers have developed a harvesting technique enabling them to harvest the long-line system through the ice, and transporting the mussels ashore by snowmobile, sledge or all terrain vehicles (Fisheries and Oceans Canada, 2003).

The fact that some of the waters are covered with ice, has also lead to a technique where the farmers are lowering their long lines below the surface in the winter months. By doing so, the ice is not destroying the long lines and loss of gear and equipment are prevented (Policy and Economics Branch, 2006).

4.5 Operational challenges

The algae problem is a substantial challenge to the Norwegian industry of blue mussel farming. Locally and at some periods of time, the poisonous algae is present in the Norwegian waters. These algae are eaten by the mussels and thereby make the blue mussels dangerous to eat. Humans can get paralytic effects, diarrhoea or even memory loss by consuming infected mussels (Hovgaard et al., 2001).

It seems like this problem has been a major challenge to the industry in Norway. It has caused long periods where sale of blue mussels have been banned and both growers and processing plants have been without income (Sandberg et al., 2006). In the last few years, blue mussel farmers in the northern part of Norway could not harvest due to the poisonous algae. However, there are indications that the problems with poisonous algae are cyclic (Tveit, 2008).

The farmers are responsible for selling mussels free of any algae poison, and have to deliver a sample for testing to a certified institution, i.e. the Norwegian School of Veterinary Science. The farmers themselves have to pay for this testing. Current costs are approximately 1 000 NOK per test. In addition to the algae testing, the growers are also responsible for testing the production plots or leases for classifying the lease and the production area (Vesterålen Fiskehelsetjeneste AS, 2004).

Eider duck also seems to be a problem for some of the Norwegian blue mussel farmers. Some companies have lost as much as 150 tons of mussels in one year due to eider ducks feeding of the crop on the suspended long lines (Myrberg, 2007). Blue mussels are an important diet to the eider ducks and as much as 95 % of the diet can consist of blue mussels. Eider ducks are in particular fond of smaller mussels in the size of 1-2 cm (Bornardelli & Næss, 2008).

Some aquatic organisms have shown up in the Canadian waters and created problems for the mussel growers. The oyster thief (*Codium fragile tomentosoides*), which is a green algae with origin in Japan, are smothering oysters and mussels, preventing them from opening their shells to filter feed. This starves the mussels and makes them an easy prey for other organisms.

One other specie which has caused problems is the clubbed tunicate (*Styela clava*). These grow in dense clumps and are preventing settlement of larvae. They compete against young mussels for both space and food. Three other species of tunicate have appeared in the last years and created additional challenges for the industry (Policy and Economics Branch, 2006).

The problem with toxic algae is also present in Canadian waters, as in Norway, and includes Paralytic Shellfish Poisoning (PSP), Amnesic Shellfish Poisoning (ASP), and Diarrheic Shellfish Poisoning (DSP). The toxins are named for the most notable symptom they cause, i.e., paralysis, amnesia and diarrhoea, respectively (Fisheries and Oceans Canada, 2003).

Duck predation is also a problem in Canada. Several other species in addition to eider duck are predated on blue mussel farms. Research institutions at Prince Edward Island and in

Quebec have done studies on how to minimize the loss of mussels to ducks (Bornardelli & Næss, 2008).

4.6 Education, research and government financial support

There is no specific education oriented towards blue mussel farming in Norway. Most of the growers have attended local courses in mussel farming. Some of these courses have been initiated and financed by the county administrations. Moreover, some websites have been established to help and guide blue mussel farmers through the process of farming blue mussels:

Skjellmanualen (www.Skjellmanualen.no) is a website which has been developed by Kunnskapssenteret i Gildeskål (KIG), an organization in the county of Nordland. The website has been developed in cooperation with Salten Skjelldyrkarlag, which is a local blue mussel organization. The website is mainly created to facilitate sharing of experiences between blue mussel farmers in the northern part of Norway (Skjellmanualen.no).

Skjellsenteret (www.skjellsenteret.no) is also a website which comprises experiences and blue mussel related articles and reports. This site is managed by Val videregående skole (a local high school) in the county of Nord-Trøndelag. It contains reports and practical guidelines regarding blue mussel farming. This site seems to be more up-to-date compared to Skjellmanualen (Skjellsenteret, 2008).

When it comes to research, several institutions are doing research on blue mussel related issues, such as the Norwegian School of Veterinary science, the National Institute of Nutrition and Seafood Research and several of the universities. Other institutions such as SINTEF and NIVA are supplying knowledge in projects linked to the blue mussel industry.

Up till now it has been difficult to finance blue mussel companies by traditional bank loans. The risk is still considered too high and most commercial banks are reluctant to finance blue mussel companies.

Most of the funding of the industry comes from the government sector. Innovation Norway (former SND) is the institution which has the task of providing support to newly established businesses. Innovation Norway has the opportunity to contribute both financially and by

giving advice to businesses. SND financed some of the start-ups in the blue mussel industry in the 1990s, mostly by grants and risk loans. Some of the grants were linked to a government program aimed at supplying farmers in rural areas with an additional income to their farms by starting up blue mussel farming (BU-support). Innovation Norway has spent approximately 100 million NOK on mussel farming since 1990 (Pers. Meld).

On PEI, the history of the blue mussel farming dates back to the 1970s. The local provincial government had some programs to finance the start up of the industry, mostly by giving risk loans and grants.

Canada/Newfoundland and Labrador Business Service Network has the opportunity of giving loans aimed at blue mussel farmers in Newfoundland and Labrador. Because of the problems in the industry of obtaining capital, the Shellfish Aquaculture Working Capital Fund (AWCF) do provide loans to aquaculture industry up to C\$ 250 000 (Canada/Newfoundland and Labrador Business Service Network, 2008). Quebec and PEI are also spending provincial budgets on blue mussel related issues.

Provincial government on PEI is running a monitoring program on toxic algae, mussel- and starfish larva. A voice mail telephone service is established, which gives the blue mussel farmers information on the current situation regarding toxicity and larvae in their area. Blue mussel farmers use this service and it helps them in production planning regarding spat collection, harvesting and predation control (Søderholm, 1999).

There are several research and educational institutions in Canada which is conducting research on blue mussel related issues. Newfoundland, Quebec and PEI do all have research institutions which work on marine related issues and projects.

4.7 Summary of the blue mussel industry in Norway and Canada

The Norwegian production and export of blue mussels have not met the expectations. Productions volumes have been decreasing the last years and problems such as toxicity and eider duck predation have inflicted many of the blue mussel companies have losses. All in all the industry has been through some tough years with several bankruptcies, declining

production and a general loss of faith in the industry. However, the companies left can be characterized as serious and long-term minded. The good conditions for growing mussels and proximity to the market indicate a potential for the industry in the future (Duinker et al., 2007). However, companies require access to capital in both the short and long term in order to maximise opportunities.

Canada is outperforming Norway in terms of volume, value and economic impact on the regions. This is despite the fact that they have experienced many similar challenges, including the necessity to adapt technology to local conditions, biological issues such as toxic algae and reliance upon government support. Norway is currently lying a decade behind Canada in terms of development. The remainder of this chapter tries to identify why this is the case and if there are lessons which can be learned from Canada to improve this situation in the future.

5 Results from interviews

In this chapter I will summarize the answers I got from the blue mussel growers and representatives of various government agencies. I have chosen not to identify the respondents. Detail are therefore omitted which could have made it easy to identify the blue mussel farmers. The companies are only labelled with a letter and a number – C and a following number for the Canadian companies and N and a following number for the Norwegian respondents. The business support systems are described in chapter 5.14.

5.1 Brief presentation of the companies

I interviewed eleven companies, five in Canada and six in Norway. The companies in Canada are divided among one in Quebec, three on PEI and one in Nova Scotia. Out of the companies in Norway, three were located in the county of Sogn og Fjordane and three in the county of Nord-Trøndelag. I have chosen to minimize the description of each company in Norway because the blue mussel industry is made up of very few and easily recognizable units.

Company C1

Located on the north of Prince Edward Island (PEI), Canada. Family run company and the family had been involved in fisheries before. However, the fisheries did not give them a steady income on a year-round basis so they looked into the opportunities of blue mussel farming. The production volume is about 1000 tons of mussels. The company has three leases. Two of the leases are within 20 minutes from the harbour and the third is 45 minutes out by boat.

Company C2

Located on the south of PEI, Canada. Company owned by the informant and his son. The informant had his background from engineering and started full time in the mussel industry ten years ago. He first started with mussel farming as a hobby. Today he has three leases of which one is used to collect spat. The three leases are operated as one and he expects to harvest approximately 400 tons of blue mussels in 2008.

Company C3

Located on the south of PEI, Canada. The informant was educated as an engineer, but worked as a fisherman before he started up with blue mussel farming. He got tired of spending a lot of time away from the family and looked for an opportunity to establish a business on the island. The company is family owned and is now run by his son. The last year the company shipped 4000 tons of mussels.

Company C4

Located in the Gasbay, Quebec in Canada and has two sites. The company is owned by the informant. It has one site for collecting spat and growing, and one site for just collecting spat. He started blue mussel farming after he had been a fisherman for several years but was forced to do something else as the cod fishing went down. In 2008 he expects to produce approximately 125 tons of blue mussels. The aim is to produce 200 tons on an annual basis. Five people are working on the farm. The owner is the only one working on a year-round basis. The others are hired in the peak season from April to December.

Company C5

Company based in Nova Scotia, Canada. The company is owned by four persons. Production is approximately 350 tons on an annual basis. The company has 8 to 10 employees and is selling its product in Canada, US and inside Nova Scotia. The informant started the company after finishing studies at the university and owns the company together with three other people.

Company N1

Based in the county of Sogn og Fjordane, Norway. It started up in the year 2000. By now, the company has several leases and the production capacity is approximately 800-1 000 tons.

Company N2

This company is owned and run by the same person. It is based in Sogn og Fjordane. The owner has two leases and is producing mussels on both leases. The company was established in 2001. The owner has used a long time to build the company and to do the right investments.

Company N3

Founded and owned by the same person and is based in Sogn og Fjordane. The company has one lease but is cooperating with one other lease owned by a family member of the lease holder. When interviewed he had harvested approximately 20 tons of mussels in 2008. He has found a niche in delivering spat to a partner and has been doing some research on his own farm.

Company N4

This company is owned and run by a family. They have 4 leases in Nord Trøndelag. The distance between the leases is less than one hour by boat. In 2005, the company harvested 200 tons blue mussel and they have taken over some leases from other companies that have given up blue mussel farming.

Company N5

The company was founded in 2002 in Nord-Trøndelag but the respondent had been working in other blue mussel companies prior to starting his own business. The respondent is chairman and one of the owners in the company. The company is also involved in doing business with several other blue mussel farmers.

Company N6

This company has nine leases in Nord-Trøndelag and is managing all of the leases for the moment. The company was founded in the year 2000 and has delivered mussels a few times. We will now turn to the interviews and the answers given by the informants. The structure of the presentation largely follows the structure of the interview guide.

5.2 Background and motivation

The major similarity between the two countries was that none of the respondents had real experience from blue mussel farming before they started their companies. They all went into a business that was new to them. However, the reasons for starting with blue mussel farming were a bit different in Norway and Canada. Several of the Canadian respondents (C1, C3 and C4) pointed at the decline in fisheries and the need of new jobs. Some had heard about the potentials within the blue mussel farming industry and others had an education which could be relevant. Typically, the Canadian respondents focused on factors such as unemployment and declining fisheries to explain why they went into blue mussel farming. None of the Norwegian respondents told about unemployment as a reason for starting with blue mussel farming. The motivation among the Norwegian entrepreneurs tended to be more related to seizing opportunities in an industry which was expected to become a future growth industry (N1, N2, N4, N5 and N6). “The big market in Europe” was emphasized by respondents N2, N4 and N6 as a reason for entering the blue mussel business. None of the Canadian entrepreneurs mentioned the market as a factor when starting up mussel farming.

Company C1 described the problems with unemployment in the fisheries and why he looked into the possibilities in mussel farming.

“Basically because we had nothing else to do. When I grew up, my father was in the lobster fishing. We did cod fishing, we did mackerel fishing and we did herring fishing. Basically we started off when the month of October came because we were working under the unemployment insurance and we were getting fishing stamps. We couldn’t draw on unemployment insurance until November.”

Respondent N2’s answer is typical for the Norwegian respondents’ motivation to take up blue mussel farming:

“There was an expectation that this had a potential. The market is huge and we know how to produce.”

Entrepreneur N1 gave a similar statement in his answer. Because N1 believed they had something to contribute to the industry regarding the toxic algae problem, they chose to enter.

When asked about their prequalification in the field of blue mussel farming, there were no big differences among the groups of respondents in Canada and in Norway. Some had no experience or qualifications what so ever, and others had a formal education and training in i.e. marine biology or technical education (C5, N3, N5 and N6). The overall educational level seemed to be higher among the Norwegian respondents.

Respondent C1 knew the water since he had been in fishing before. Apart from that, he had to use the method of trial and error.

Respondent C2 answering when asked about his qualifications:

“None as far as mussel farming is concerned. Nobody had any experience. So everyone was starting off not knowing a whole lot.”

Spokesman N4 had a similar response to the question:

“We knew very little.”

The respondent in company N5 discussed his qualifications within science and the necessity for knowledge in order to be successful in the industry:

“I would say that both the Directorate of Fisheries and Innovation Norway have not taken the knowledge aspects serious enough. The goals were quantitative rather than qualitative.”

5.3 Development of the business and financing the start-up

All the companies developed differently, both in Canada and in Norway. Some had come a long way in volume, profitability and number of leases. Other companies had just harvested once and were still trying to get a profitable business. The businesses on PEI were, in terms of volume and value, bigger than the companies in Quebec, Nova Scotia and in the two different regions in Norway.

Among the Norwegian respondents, there were three companies which can be described as more hobby operations and three companies with people employed and working at the farms all year round. The Canadian respondents were all actively working at their farms all year. In general, the development in the Canadian respondents' businesses seem better compared to the Norwegian ones, and this is reflected in the answers.

Respondent C1:

“There has been a huge growth. Taking the statistics from the province in the 80s. The entire island had a turnover of maybe a couple of million pounds. Now we have almost 30 million pounds. In the last five or six years it has levelled off just mainly because we have reached maximum capacity.”

Respondent C2:

“We started roughly ten years ago and we had practically nothing on our lease. Now we have our lease fully operational and as far as we can grow on it.”

Spokesman of C3:

“When I first moved here, there was no one growing mussels and probably one of the reasons for my success was that there where nobody to teach me. I had to learn everything the hard way.”

But the spokesman of company C3 also emphasized the importance of being small in the beginning:

“When we made a mistake, it was a mistake we could afford. When you are big and make a mistake, it costs you a lot of money.”

Respondent N1 was not too happy about the speed in the development of the business:

“We think it has been too slow.”

Respondent N2 described the development as a rollercoaster.

“It has been a rollercoaster, because it looked straightforward in the beginning. And it was that way until one had been through this a while and got more knowledge of the status and learned what the problems were and the challenges and things like that.”

Respondent N6 emphasized that they are still a relatively small company:

“We have tried to lay stone by stone and have started being small and are still small, focusing on finding the right sites and identifying simple but good methods of production.”

All of the respondents, both in Canada and Norway, referred to problems getting the business financed. PEI had some government programs to finance the start-up of the industry. Some of the Norwegian companies received grants from Innovation Norway to finance equipment in the initial phase. Both countries reported on problems of involving the private banking sector in the blue mussel business, but the Canadian companies seemed to be more involved with bank financing. However, respondent C2 described the banks as reluctant to financing blue mussel operations. Bank financing of the companies were not an issue among the Norwegian respondents.

Entrepreneur C1 went through a government program through Enterprise PEI. The interest rate was up at 15-16% and they had to put up the lobster boat and the house as collateral. He

said they could go to banks and get money if needed. However, he had some remarks regarding the banking sector:

“It all depends on who’s there. We went through a lot of people at our branch. We used to deal locally with the banks but just the way that the banks have ended up now, you have to call Halifax, etc. And you do not have the personal relationship with them anymore. The one that we were dealing with, she went on maternity leave...”

Respondent C4 had a remark about the way the funding from the government was aimed:

“So you need help from the government. There is nowhere else to go. The government has to get involved financially and it’s also so with the people. You have to supply biologists and people to help the farmers to get going. And not only to get going, but you need support thereafter. That’s very important, because I found it was a lot easier to get going than to keep it going. It’s a big difference.”

The Norwegian entrepreneurs had all used private equity as a source of financing and some referred to Innovation Norway and grants on investments.

N1:

“It’s our own money. We have got some help for funding new technology but not for the company. It is own money, we have used a lot of own money.”

N2:

“I got support from Innovation Norway when I first started up. It was the deciding factor in establishing the business.”

5.4 Technology and equipment

All of the companies, worked on developing equipment or improving existing technology to suit the local conditions or their own specific requirements. There is a need for developing new machinery to improve the efficiency of operations – this is relevant for the entire value chain. Both countries need to increase the level of research in this area.

New threats and problems like the tunicates on PEI is also another reason why it is necessary to develop the mechanized tools in the industry. Invasive species was not mentioned as a problem in Norway, but two of the Norwegian respondents referred to work in order to avoid the poisonous algae (N1 and N3).

Respondent C3 had to develop own machinery when he started up, and he was pointing at the help he got from government programs. This was to develop better declumpers, debyssers, harvesting machinery and star fish treatment:

“Star fish is a big problem on PEI, so we found out very quickly to treat them with lime solution, which is very environmental friendly. We just dip our collectors in high degraded lime, so we got some government money to build a shot and dip tank. It would not hurt the mussels and the lime would not kill the star fish, but it really made them mad, so they kicked off and went to the bottom. If we didn’t figure this out, we would not have any mussel industry because the starfish would eat our seed.”

Respondent C3 also pointed at other areas where they had to adapt the technology:

“... and different types of flotation, so the waves would not knock our mussels off, because our waters get so warm the mussel get so loose. So we had to adapt to different types of flotation and different culture methods, different anchor methods on the farm, more cost effective. The best way to make money is to cut costs.”

Respondent C4 told about an organized trip abroad to search for suitable equipment:

“I started with existing technology which I thought was no good, but I had to get started with something. After we developed different things but we organized some trips to Chile, Norway, Spain, France and Ireland and went all over the place to see what other people are doing. We got equipment that worked other places but we had to take it apart and build it differently. But you have to go to other places to learn and to see how they do it and see the machinery and the boats and all that.”

Entrepreneur N3 had developed a series of different tools to increase productivity in the business. He reported about developing both a socking machine and a harvesting pump. He has also been to New Zealand to see and learn how they are conducting their operations when socking the spat. N3’s approach can be compared to company C4 as they both went to other blue mussel farming countries to get ideas about and input on useful and functional machinery.

Respondent N1 mentioned the need for developing equipment which would allow them to harvest the blue mussels at a faster rate:

“I think we have to come up with systems that are a lot faster.”

The respondent in company N2 was working to modify his equipment with the goal of being able to harvest alone. By doing the job alone he would become more flexible and ready to harvest on a shorter notice.

“If you loose a few days waiting for people, then it’s just a mess, because you have to keep the schedule with the trucks and the people waiting for the mussels.”

5.5 Market and prices

It seems like all of the Canadian respondents are delivering their mussels to local plants in their district. The supporting infrastructure, such as blue mussel plants, seems to be established in all the provinces of the respondents in Canada.

The Norwegian farmers' customer base is spread over a wide geographical area. Some are delivering bulk shipments to France while others deliver solely in Norway. Two of the respondents had access to a processing plant and were processing their own mussels. These two companies can be described as integrated blue mussel companies.

One major difference between the two countries is that none of the Canadian companies reports on shipping mussels in bulk to foreign countries, such as company N1, N2, N3, N5 and N6. Only company N1 were in position to deliver fresh mussels to the Norwegian domestic market.

Blue mussel farmer C2 said he had little opportunity to shop around and most of the local plants were vertically integrated and had their own crop to harvest:

“Most of the plants are vertically integrated so they have their own crop that they process. They say that everyone gets the same chance to harvest and so on, but if I owned a plant I would certainly look after myself better than someone else... So that's a big problem we have, trying to schedule the harvest, and to get the money we need..”

Blue mussel farmer N1 was from the only Norwegian company which operates its own plant. They were selling through a Norwegian fishmonger who sold both in Norway and the rest of Scandinavia, and was focusing on increasing the volumes sold:

“We need a turnover in the farms. If the mussels get too old, they fall off and are not possible to sell, and it's not like you can sit still and look at an inventory. It's dynamic, biological dynamic.”

Respondent N1 emphasized that it was difficult for them to guarantee a certain volume delivered to the customer. For the time being, they were focusing on increasing stability in the production. He did not believe that the Norwegian market would be big enough for them in the future, and the company was working simultaneously on building relations towards European customers.

Regarding the price development for blue mussels, most of the responding entrepreneurs in Canada were not satisfied with the prices they were paid. The Canadian farmers were more preoccupied with issues such as the increase in fuel costs and wages compared to their Norwegian colleagues. Some of the respondents in Canada commented upon the the low price, and three of the respondents reflected on the way that the plants was dealing with the farmers and how they acted in the market. Some of the respondents in Canada thought that the plants were competing too much against each other in the market. Some of the Norwegian companies interviewed related prices to the quality of the mussels.

None of the Canadian respondents mentioned any competitors as a factor when discussing the prices on mussels. Competitors were a factor which several of the Norwegian mussel farmers took into account.

Entrepreneur C1 compared the price on the mussels to the costs on fuel, wages and the exchange rate of US dollar versus Canadian dollar, and he was not content with the development:

“When we started we were getting 55 cents. And that went on for ten years.”

Also entrepreneur C2 underlined the current exchange rate of the Canadian versus the US dollar. He is also pointed at the processing plants and the way they set the price on mussels:

“The same with the price, they tell you what the price is.”

The respondent in company N1 thought the price was as expected, but the prices in the Dutch market had been higher than expected, and he saw this in the context of new regulations in the domestic Dutch production:

“Prices in the Dutch market are higher than expected, given that domestic production is not meeting demand. This is due to the fact that new regulations mean prohibit putting new seed on the bottom cultures, to trawl for spat or to ship in spat from other places. The domestic industry is grinding to a halt - there is an opportunity for Norway to enter this market.”

Respondents N1, N2, N4, N5 and N6 were not negative to the development of the prices.

Entrepreneur N6 linked prices to quality:

“When we are able to deliver an even size and are able to deliver on a regular basis, then I think that the price will follow. The price we got last year was approximately 5,50 NOK per kg. That’s not good enough and not to live with, but if we are able to increase the quality and the volume, then the price is going to follow.”

5.6 Important collaborating partners

The blue mussel farmers on PEI pointed at the provincial government as a helpful collaborating partner to their companies. Respondent C3 referred to the fact that the provincial government supplied the first packing equipment from the Netherlands and leased it to the mussel farmers on the island. Most of the blue mussel farmers in both countries were cooperating with other blue mussel farmers. Some of the Norwegian companies referred to Innovation Norway and the county administration as helpful collaboration partners for their businesses.

All the respondents in Canada, C1-C5, were referring to different governmental levels as important collaborating partners to their companies. The levels were different; some referred to the provincial government and others to the federal part. Innovation Norway was frequently

mentioned as important for the Norwegian farmers. This can be regarded as the Norwegian counterpart to the Canadian participation from provincial authorities in funding the industry. Regarding other blue mussel farmers as cooperating partners, there was no big difference between the two countries. Fellow blue mussel farmers were frequently mentioned as important cooperating partners among both the Canadian and the Norwegian blue mussel farmers.

The spokesman of company C1 was pointing at the provincial government as important.

“When we go down the provinces, the first thing they comment on is our relationship with the provincial guys. It’s key. Like the federal guys, they are going to do what they want to do at the best of times. But that’s up to the federal guys who control the provincial guys. But it’s the provincial guys that you have to deal with all the time.”

Entrepreneur C3 also referred to the government and expressed that the job of the government was to create a business-friendly environment for the blue mussel growers:

“When I started off there were a dozen people at the eastern end of PEI that were in the same situation as I was. We had a few mussel lines out and we all had the same problem. What are we going to do with them, there is no fish plant wanting to buy them or wanting to invest the money into equipment. So what we did, we formed a co op. And this is where the government came in. They bought the first mussel plant, a mussel line, out of the Netherlands and put it into a leased building here, so basically the government owned the mussel line. It took us five years to wear it out and we gave it back to the government, and they rebuild it and probably lend it to somebody else.”

Respondent N1 got a great deal of help from the National Guidance Office for Inventors, which was part of Innovation Norway. He also pointed at the board of the company which brought in people with experience and a network useful for the company:

“You have to deliver and you are held responsible in another way if you are sitting as the only owner and run the business by yourself.”

Entrepreneur N2:

“Cooperating partners exist in different categories. One issue is getting started at all, and Innovation Norway was decisive there.”

When asking specifically on how the cooperation between the government and the companies worked out, most of the Canadian and the Norwegian companies were satisfied with the cooperation between the industry and the government agencies. However, the respondent from company N1 described the government as passive and not involved in solving the problems and issues within the industry. Entrepreneur C1 had a good relationship to the provincial government, but was more critical towards the federal level. The spokesman of company C3 believed PEI had been a model to the rest of the world regarding the cooperation between the government and the blue mussel industry.

None of the Norwegian companies came up with examples like the Canadian colleagues regarding active involvement from governmental bodies.

Respondent C1 said:

“The provincial guys, yes, we do work very well. The federal guys, well, you know, it’s my way or the highway. And that doesn’t always work with us. And the provincial guys, no. As I said when we founded the NWPA, the provincial guys were right behind us. And we told them, shut us down, we do not care; you are not shutting down a 30 million dollar industry. Say what you want, it is not happening. The provincial guys were right behind us. You are saying this and that, let’s do it. Let’s find solutions to suit everybody.”

C3 held a similar opinion:

“I have always said it has been good. PEI has been a model for the rest of the country or the rest of the world as far as cooperation between the industry and the government goes.”

The spokesman from company C3 also mentioned the special surveillance program run on PEI:

“We came up and said we want monitoring, maybe spat monitoring programs, where we can pick up the phone and phone an 800 number and get a tape recording and find out how much larvae is in our waters. This is something they would do, the government would go around with boat and take water samples in all the mussel areas and bays and then do a recording of it and we can phone in to it and then we know when to put the collectors out. So that’s a good example of a program that has been in for a long time and the growers would hate to loose it. They check for star fish and since they take the water samples, they can check for toxic algae at the same time.”

N1 described a degree of general scepticism regarding how the Directorate of Fisheries looked upon the blue mussel sector:

“I feel that the Norwegian Directorate of Fisheries is regretting the amount of allowing so many leases. The industry has not been as successful as was originally envisaged. They are now concerned about over-extending their budgets and trying to distance themselves from the industry.”

Entrepreneur N5 was more positive in his description of the cooperation:

“When meeting people from the different governmental institutions which we have to deal with, I feel they are very positive. They wish me

good luck in my work and if they can push the envelope to get things done, they do.”

5.7 Degree of sharing of information between companies

Most of the companies in Canada thought there were a good amount of openness and sharing of information among the blue mussel farmers. Many of the respondents expressed the advantage of sharing information; they saw this as very positive contributing to overall growth within the industry benefiting everybody.

Although some of the Norwegian companies were sceptical towards the question of how open they should be with their counterparts. Companies C3, N2, N3 and N4 were more reluctant at this point. Respondents of companies N2 and N3 referred to a specific incident which hurt the cooperation among the local blue mussel farmers.

Respondent C1's answer was typical for the Canadian respondents:

“I think it's pretty good. I do not think... I do not think everybody is telling what they are doing all the time, but if somebody has an idea, they try how it works and you do not have anyone who says that you can't come and look at my stuff.”

Entrepreneur C4 commented upon why it is so important to share knowledge and experience:

“We try to help each other and the reason is simple. If you want to get in the business in the markets, you need big volumes. If you only have a small volume, no one wants to talk to you. If you have a lot of mussels, then you become more important and people want to talk to you. They want to talk about price and production and all of that. So we all have a big advantage of sharing information so we have a bigger production.”

The spokesman for company N4 saw that there was openness regarding the production process, but it tended to become more complicated when there were prospect of government project financing and grants, due to competition for limited funds:

“In the production, I think there is a good degree of openness and sharing of information. But when you push further and you are talking about projects, financing and grants and things like that... because everyone is in acute lack of money, so to run projects, then the communication suddenly closes.”

5.8 Membership of organizations

All the companies both in Norway and Canada were members of some kind of blue mussel farmer member association. PEI established their blue mussel growers' association 25 years ago and later merged it into the Aquaculture Alliance. In Norway, most of the interviewed companies were members of the FHL, but two companies (N2 and N3) were members of the local county's blue mussel farmer's organization.

Respondent C1 argued why it was important to have an organization:

“The provincial government was really supporting the idea of having an aquaculture alliance, because they were having too many little groups come and fight on issues, you know, here and there.”

Further on, the respondent in company C1 gave a reason for why he saw it important for the organization to be independent of government funding:

“We are actually on a voluntary levy system right now. I think we are at about 70% of the funding right now, and it's key to get to a hundred percent because we need to stand separately from the government because it's really hard to go bang the fist on the table and say no you are going to do this and you are doing that and that's not right and by the way, can I have some money?”

Entrepreneur C2 had experience from Norway as he had previously worked in the country:

“And even in Norway the association is very important to have. They had problems there, maybe this guy got five cents more than me and they were trying to develop programs for the industry and in Norway, the people I knew, they just wanted the money. They had money problems.”

Company N1 was a member of the Norwegian Seafood Federation (FHL), and the spokesman listed up the pros and the cons:

“The pro is that we have someone to talk to and it’s an organization which is taken seriously, which means that we have to take ourselves seriously. We need to conduct our affairs in a proper manner. We structure ourselves and we impose a regime. The negative side is they only have limited power. The blue mussel industry is a bit weak, so we are strained by not being able to operate where we want. It has to be coordinated and it is a lengthy process.”

Companies N2 and N3 are members of the local blue mussel farmers association, but some disagreement regarding the establishment of a local plant disrupted the cooperation and the organisation:

Respondent N2 said:

“Yes, I’m a member of the local blue mussel farmers association. After the information meeting at the factory, which is the last meeting I know of, things have been quiet. ...After the meeting things went in different directions, I guess.”

5.9 Major challenges

All of the companies have had some kind of challenges in one way or another, including economical challenges regarding capitalizing the companies, market challenges, problems with invasive species and some regulatory challenges in Norway.

The companies on PEI were to a large extent focusing on the challenges with invasive species (C1, C2 and C3). Entrepreneur C1 linked the tunicate invasion to the surge in prices on fuel and labour, because fighting the tunicate was labour and fuel intensive. The ongoing battle against the tunicates in Canada is one of the greatest challenges the industry had faced to date. Invasive species was not an issue for the Norwegian companies.

Two of the Canadian companies referred to the difficulties in capitalizing the company (C1 and C3). Four of the Norwegian companies (N1, N2, N4 and N6) reported on having a struggle on financing investments to increase production. Respondent C5 also pointed at the general challenge of increasing production volume.

The spokesman for company C3 described his problem with the banking system when he started in the blue mussel business:

“The biggest problems I had were that I had to educate a bank manager. I always dealt with the private sector banks, so basically I had to educate the bank managers on how the mussel industry works. And it was a nightmare if the bank manager got transferred and then you had to re-educate a new one because our cash flow is different.”

Entrepreneur N1 pointed out that there were difficulties in getting the public sector to understand the challenges of the blue mussel industry.

“The government has no strategy and they are putting the salmon industry up-front for what it’s worth. And they have money and the government do not look upon us as something different than fish farming, and the fish farming industry has a lot of money, so it doesn’t

matter. A regime of salmon is being put down on our neck. That's the way it is."

5.11 Strategy on blue mussel farming

None of the companies in Canada or Norway were aware of any overall government strategy towards the blue mussel industry. One of the Canadian entrepreneurs (C1) knew of a provincial strategy to fight the latest problems with the invasive species, like the tunicates. Respondent C5 thought the government was good at making plans but not to put the plans into action.

Respondent N6 knew about a regional plan towards the blue mussel industry:

"We have a regional plan, Marine Strategy Plan for the counties of Trøndelag."

None of the other Norwegian respondents knew of a national strategy. The spokesman for company N1 thought that if a strategy existed, it was fragmented among the different governmental levels and functions.

5.12 Deficiencies in government support

There were some similarities between the countries when asked about government support. The difficulty in accessing capital was mentioned by companies C2, N3, N4, N5 and N6.

Companies N3, N5 and N6 specifically mentioned the difficulties in accessing start-up capital.

Support for R&D activities was mentioned by company C1, C2 and C5. Company C5 was the only company negative to investing more public money into the business, because the respondent of the company felt this tended to destroy other companies.

Respondent C1 saw in what area he expected government backup:

“The federal government got to step in more and start doing some programs like there is some money coming down for new equipment, because everything is getting heavier, we got to get new equipment, some of the guys got to find new boats, this and that.”

The spokesman from C2 had an idea of in what area government support where needed:

“The main support we are missing is financial support for the development type of work. We have been crying about this for years. The federal government has a lot of programs for what they call science and technology. Our complaint is: that is all science and it takes a long time to get out something useful. In the meantime we have to deal tomorrow morning with the problems, so by the time anything comes out of the universities we either have it solved or we are out of business.”

Respondent in company N1 put the government support into context with the restructuring of the industry in Norway:

“I feel it’s about time the government starts to think a little bit different and says what can we do to create viable groups? There are showing up some owners and some groupings around the country that can be viable and has taken the task of restructuring the whole game. Left are a handful of companies which it is possible to relate to.”

N5:

“Yes. And that is the possibility of getting financial support to conduct business. I believe it’s a tragedy that Innovation Norway hasn’t taken serious the problems in raising capital and hasn’t put more effort into solving the problem. This is an urgent matter, especially regarding how the banks are acting now.”

The overall impression is that financial assistance is more of an issue among the Norwegian companies compared to the answers from the Canadian colleagues. Canadian companies were relating the missing government support to the problems with invasive species and the need of R&D programs to overcome the problem. In Norway, the need for financial assistance was to a large extent related to the need for increasing the production.

5.13 Future perspectives

All the companies in Canada and Norway came up with a series of future challenges in the industry. Quality is an issue which preoccupies companies both in Norway and Canada. The respondents of companies C1, C4, N2-N6 all mentioned the need of improving the quality.

Because of the high production volume on PEI, entrepreneur C1 saw the need of cutting back on the production in some of the bays.

The respondents of C1, C3, C4 and C5 mentioned the invasive species as a future challenge. Problems regarding invasive species was not an issue among the Norwegian companies.

Companies C4 and N1-N5 mentioned the need for raising the quantity of mussels produced. In the same context companies N4 and N5 mentioned the challenge of getting access to capital in order to do the investments needed to raise the volume. The spokesman of N5 referred to several issues which still are not solved in the industry and linked this to governmental involvement.

Respondent in Company C3 pointed at the need of adapting to a shifting environment:

“Invasive species and global warming. And there is one thing that is the same for mussel farming as any other industry: nothing stays the same. Every year is different. So you got to be able to adapt. And if there comes a time where you have to get out, you hopefully can do it without going bankrupt.”

The spokesman from Company C4 argued towards future cooperation:

“I think, make the people stick together and work towards a goal. Not quantity but quality first and take care of the environment and make it a smart business. One of the days it’s going to be a big business and I think it’s going to be important to make sure that people take care of the environment and I call that clean job you know, you are not polluting or nothing. And make sure that people stick together, that they not divide.”

The respondent in company N1 talked about the need for more effective logistics throughout the value chain:

“The two days that we are missing compared to the plants in Holland, doesn’t have to be a problem if we optimize the process. I do also think that the equipment on the boats is a challenge, being able to harvest effective and carefully”.

The spokesman of company N5 linked the need of research with the lack of capital:

“It’s difficult to range the different elements because the industry is in such different phases. It’s a must to have sufficient capital to do the right investments and run practical operations. In the business today, there is a lot of research and development going on, because of all the issues still unknown to us. This indicates the early phase which the industry is currently in and the point is that we are spending our scarce finances on R&D, which should be a government job.”

5.14 Interviews with business support systems in Norway and Canada

The regulatory and business support systems in Norway and Canada are quite different. This is even that case internally in Canada where the provinces have adopted different approaches, making it difficult to compare the development between them. In Norway, such differences can also be found to a certain degree between the counties due to the county administrations' diverse approaches to the industry.

Three governmental agencies in Canada were interviewed, representing both federal and provincial. Two Norwegian business support organizations were also interviewed. By interviewing these different institutions I wanted to examine if there are differences between how the government and the companies Norway and Canada worked together to solve issues in the blue mussel industry. I was also interested in learning more about the organization of the industry in the countries. The interview guide had some more questions but I have chosen to focus on the most relevant issues.

CC1 is an aquaculture development organization established a decade ago. The goal of the organization is to develop and accelerate R&D in the aquaculture industry in Quebec. It is basically a risk capital organization founded to provide financial assistance to the aquaculture sector.

CC2 is involved in development programs working directly towards the blue mussel industry on PEI since the industry started on the island. The main task being to deal with the industry's problems and issues. The mission being to provide relevant and timely information.

CC3 primary function is to administer the leases on PEI. However, it also manages the sites to ensure they are properly marked and within the boundaries. It is also collects information on new sites, and acts if there are complaints regarding any mussel sites.

NN1 is a membership organization working to improve conditions for the aquaculture industry in Norway.

NN2 is a state owned company working for the promotion of industrial development in Norway. It contributes financially to the Norwegian industry.

The cooperation between government and the blue mussel industry

The spokesman from CC1 asserted that cooperation was poor prior to the establishment of their organisation. However, the creation of the organization helped to build a link between the companies and R&D. By communicating with the mussel farmers, they were able to identify where there was a need for research and channel money to the right areas.

Respondent CC2 described the cooperation as good:

“I would hope it’s fairly good and I think it’s a very good relationship, but nothing is perfect and we have our discussions from time to time but I think we have a good relationship with them. A part of that is that we do not regulate, we are not regulators, basically because it’s hard to do both. You can’t prevent something that is fundamentally wrong and try to develop the firm the next day, so...”

The interviewee from CC3 was also positive regarding the cooperation.

Respondent NN1 believed the cooperation had been up-and-down. One of the reasons being that the blue mussel industry in Norway has been divided with frequent disagreements on how different issues should be handled. Another problem identified is the lack of coordination between projects in different counties, however this appears to be improving.

The spokesman at NN2 believed that the cooperation is good; he asserted that the former policy of supporting a lot of start-ups in the industry had created problems in the past.

Development in the industry to date

Respondent CC1 described the industry as very small with a production of only 600 tons per year, but saw the development moving in the right direction:

“We have to think more about commercialization and do something in terms of productivity. We have to decrease the production cost. I think we have a good collaboration environment and everyone is trying to do the best for the industry”

The spokesman from CC2 described the development as very rapid, coming from nothing and growing very quickly:

“Compared to agriculture which has been there for hundreds and hundreds of years...regarding the strategy around pest control and other issues, they have had a lot of time to fight that and we have had to do that whole thing in a fairly short period of time. And it's still catching up with us. That's the reason why there is a lot of issues, the antifouling for example, it thinks that's a good example. So we have to look at New Zealand and try to adopt what they are doing. It's a real challenge with the ducks and the antifouling issues.”

Respondent CC3 referred to the development as huge, the consequence being that production in most bays is now at maximum capacity.

Spokesman NN1 described the development as shifting. Due to the restructuring process in recent years, most of the hobby operations with only the bigger companies surviving. However, the development is slow:

“It's going slowly. We were optimists a few years ago and believed it was going to take off. Some places like Trøndelag and Agder are doing fine, but other areas are struggling more on different issues.”

The Spokesman for NN2 pointed at the competition in the European blue mussel industry which took the newcomers from Norway by surprise. New owners have entered the Norwegian industry and are taking action on restructuring.

Main previous and future challenges

CC1 pointed at the mix of all the different challenging factors. One of the major ones being know-how. They are constantly looking for new technology to test and adapt. CC1 saw the commercialization and the increase in productivity as major future challenges. Distinction of the products in terms of branding them as originating from PEI is a major task. Many of the growers had been in the business up to ten years and felt the pressure on liquidity.

CC2 also pointed at several challenges, particularly highlighting both the rapid growth of the industry on the island and when the toxic mussels that went into the market in 1987. Development of technology had also been an issue and recruiting people has been difficult of late. The tunicate problems make the socks very heavy due to the on-growth causing a number of skilled people to leave the industry. CC2 was also concerned about the consequences of invasive species. It is difficult to find proper equipment to deal with the problem requiring a “hands on” approach to identify the specific problems in the industry in order to deal with them.

CC3 saw the invasive species and the expansion of the industry as the main challenge. Due to the rapid expansion of the industry on PEI, the government were trying to catch up with the industry in managing the capacity in each bay.

NN1 stated that the work on quality has not been good enough. The major problem up to now has been the low volume, resulting in problems getting access to the market. Technology, equipment and cooperation between the counties have also generated problems.

NN1 pointed out the need to work on quality and raising production volume. Toxicity was also a challenge - there is a real need for strengthening cooperation between the counties to enable year round production. Promoting best practice in the different parts of the industry was a future concern.

NN2 saw the structure as a major problem. Small volumes and promising too much to the market had damaged the industry. The problem of poisonous algae had also proven to be an obstacle. To date it has been a trial and error process. Getting competence into system had proven to be a challenge. There were many skilled people within the industry; however low skilled day-to-day operations were often prioritized, meaning the higher competence was often underutilised.

NN2 stated that organizing the business in a proper manner was desirable, but also the need to raise capital and to be realistic and do the right planning. The respondent believed the companies left in the industry were capable of achieving this.

6. Comparing the Canadian and the Norwegian blue mussel industry

In this chapter I will discuss the main findings of the previous chapter and try to clarify why the Canadian blue mussel industry has been able to outperform its Norwegian counterpart. I go through various possible explanations in order to answer my initial research question. The discussion is also based on other articles, papers and reports.

6.1 Natural conditions

Blue mussels exist locally as specie both in Canada and Norway. Research indicates that some areas are better suited than others for growing blue mussel, taken into account factors as presence of blue mussel seed, toxic algae and abundance of plankton. Sea temperature and presence of other species which impose a problem to blue mussel farming are also factors which have to be taken into consideration in looking at suitable areas to conduct blue mussel farming. All of these factors apply equally in Norway and Canada.

Canada and Norway have both similarities and differences in the natural conditions for blue mussel farming. Ice is rarely an issue for Norwegian mussel farmers, but a few leases in some of the fjords may have ice in the winter months. Canada has a more arctic climate in the winter and most of the leases on PEI and Quebec have to take precautions to avoid damage to their long lines. However, Canadian blue mussel farmers have adapted technology and are able to harvest through the ice, which means they have overcome this obstacle.

PEI has a lot of agricultural activity and the surrounding water is quite shallow (Søderholm, 1999). This may lead to fertilization of the sea and more productive waters where mussel and other filtrating organisms grow at a rapid pace. Such factors were not mentioned by any of the respondents, but it could impose a positive factor for blue mussel farming in the surrounding waters of PEI.

Problems with invasive species like the tunicates is an ongoing battle on PEI and the problem could lead to stagnation in the industry. The blue mussel farmers interviewed spend a lot of resources on their farms trying to rescue the crop from species like the violet star and the golden star tunicate. Invasive species have not yet imposed any threat to Norwegian blue

mussel production and none of the Norwegian respondents mentioned problems like their counterparts on PEI.

Duinker et al. (2007) discusses the problem with algae poisoning which up to now has been a real challenge to Norwegian blue mussel farmers. Large areas of the Norwegian coast have this problem from time to time and it has been challenging to overcome for the blue mussel farmers. The authors points at the fact that the problem exists in most of the blue mussel producing areas in the world and still the industry manages to live side by side with the fluctuating problem.

PEI in Canada faced this problem back in 1987 when three people died and more than one hundred got sick from eating poisonous mussels. ASP was present in the mussels and the control routines did not detect the problem. This led to the establishment of a monitoring program where the provincial government on PEI is now responsible for the monitoring of the sites around the island. This service is free of charge to the mussel farmers (Søderholm, 1999).

Norway has not had a major incident like on PEI in 1987. Each individual mussel farmer is responsible for delivering a test to the Norwegian Food Safety Authority. Norwegian blue mussel farmers do not have access to a national scheme of free testing or monitoring and it seems like the blue mussel farmers on PEI have an advantage having such a system in place. However, PEI is a relatively small island where the mussel farming activity can be defined as a cluster, making it easier to establish such a program, compared to the Norwegian coast where the geographical distances between the leases would make it more expensive to conduct such a program. There may be a possibility to establish such a program in certain regions of Norway with good conditions for blue mussel farming and to create a cluster where the blue mussel farms could be in relative proximity, lowering the cost of a government test scheme.

Through the interviews, there was nothing which indicated that Canadian blue mussel farming is conducted in more suitable natural conditions compared to Norwegian blue mussel farming. Problems such as toxicity exist in the coastal waters in both Canada and Norway, but the government on PEI has established a scheme to monitor the problem. On the other hand, PEI blue mussel farmers have a real problem with the invasive species, which is a worry the Norwegian blue mussel farmers do not have.

6.2 Background, motivation and premises

As discussed in chapter 2 blue mussel farming in Norway can be considered an entrepreneurial activity. The companies are small, owned and run by the same persons and the field of business is new and consists of a series of challenges. These challenges can be biological, physical, marketing related or economically related. In the article in “Norsk Fiskeoppdrett” (Duinker et al., 2007) the challenges in building the blue mussel industry in Norway is compared as a déjà vu from Canada. Norway has lost a great deal of the smaller blue mussel companies in the evolution of the industry. Further on in the article Duinker et al. (2007) states that “*the persons who believed in a simple way to the success with minimal effort, are now gone*”. In this perspective, and in light of the entrepreneurship theory, it is interesting to have a look at the motivation behind the start-up of blue mussel farming.

Henreksson (2007) discusses push and pull factors to self-employment versus entrepreneurship. Seeing a lucrative opportunity for business is one of the reasons to start your own company. Others start their own business simply because there is no other option locally for making a living. If you are determined to live in a certain place, starting your own business is in many cases the only option. The difference is also referred to as opportunity- and necessity-based entrepreneurship.

None of the respondents, neither in Canada or Norway had taken over companies which were up and running. All of the respondents had started their own companies from scratch. The decline in fisheries is mentioned among some of the companies in Canada as a reason to going into blue mussel farming. Others saw the opportunities in blue mussel farming and applied for a lease out of the motivation of participating in a business with potentials. All of the respondents can be described as entrepreneurs within blue mussel farming business.

The pull factors among the respondents would be defined as the possibilities they saw in the industry, the opportunity to use their education within a field of interest and the possibility to use the local natural premises as a resource for doing business. The push factors among the companies could be defined as local decline in fisheries, and such a reason to starting up blue mussel farming was referred to by two Canadian companies. All of the respondents in Norway are referring to what could be defined as pull factors as a reason why they picked up blue mussel farming. None of the respondents mentioned prior planning such as business

plans or other kind of thorough analysis which indicated possibilities to do business in blue mussel farming before starting up the blue mussel companies.

The commitment to succeed in a business might be stronger if the motivation of starting up within a new field of business is related to the need of creating your own job. All of the Norwegian respondents had jobs when they entered the industry and this might be one explanation to the difference between PEI in particular and Norway. Söderholm (1999) is also pointing at the need of replacing jobs lost in the fisheries in the 1980s and the stagnation in the productivity in agriculture on PEI as reason to why blue mussel farming was established as an industry. Such a need to renew the economic foundation of local society might also trigger local business support agencies to supply adequate support to the industry. Skjellmanualen (undated) also points at such an explanation towards the relative success among the blue mussel industry in the counties of Trøndelag. The Norwegian approach in the 1990s was to a large extent focused on giving grants to farmers in the rural parts of Norway, with the aim of blue mussels being an additional income to the farming activity. Johnsen (2003) also refers to low entry costs to blue mussel farming in Norway and the prospect of good prices in the market as a reason to why so many Norwegians started up blue mussel farms. If the Canadian blue mussel farmers started their businesses out of a need for creating local jobs, it is a paradox that they seem to have come further in creating a viable industry, especially on PEI.

Duinker et al. (2007) point at the increased knowledge among the Norwegian blue mussel farmers on natural conditions, use of equipment on harvesting and care of the mussel crops. However, according to Winther et al., (2006) there are still some major challenges to overcome in the Norwegian production of blue mussels, such as choosing the right leases, challenges regarding harvesting, packaging and logistics.

The blue mussel business has shown to be more complicated than many expected when the business began in Norway. Some counties arranged blue mussel farming courses and there have been several programs run to increase the knowledge among the growers. In the last two years the counties of Agder, Rogaland, Hordaland and Sogn og Fjordane have run a program to increase the knowledge regarding biomass control and socking among the blue mussel farmers. A similar program has been run in Trøndelag, the so called SUABIT program.

Compared, the knowledge of blue mussel farming prior to starting up the companies seems quite similar in Canada and Norway. Some of the respondents had no knowledge of blue mussel farming, while others had formal training in marine biology. None of the respondents had any knowledge of blue mussel farming when they started their own companies.

The respondents in both countries were all more or less pioneers in the business and are well established. Being pioneers in their business can explain why they did not have any training or background from the business. However, it shows one of the major problems in the blue mussel farming industry. Having to acquire the knowledge simultaneously with building the company is a challenging task making the companies and the industry fragile and vulnerable to all the different challenges they are facing.

Antonelli (2007) discusses knowledge as an economic good, looking at knowledge as a basic input in creating efficiency and as a separate item not embedded in the capital products or organizations. Universities are responsible for producing and distributing knowledge and firms are expected to be able to collect and implement the knowledge.

The fact that none of the respondents either in Canada or Norway had any experience from blue mussel farming, leads to another paradox. Although the Canadians had no experience, they have managed to build a successful blue mussel industry. The Norwegian initiative came approximately at the same time, but has not been as successful. The answer to this might be found in the cooperation between the research institutions, the government and the blue mussel companies. Duinker et al. (2007) refers to Newfoundland as an interesting case, and points at the coherence between different research programs in blue mussel farming and the growth of the production volume. This indicates that involvement by the government and a clear definition of where to invest in research and development is necessary to build volumes and profitability. Blue mussel farmers on PEI referred to several R&D projects which had helped them with knowledge and equipment which might be one explanation to why the industry on PEI has had a success. Norway has also had its share of R&D projects among blue mussel farmers, but it seems like the effect of these can not be compared to the ones on PEI.

6.3 Structure

The structure of the blue mussel industry in Canada and Norway is quite similar. The companies interviewed were a mix of small family run companies and bigger ones owned by entrepreneurs and investors. Some were integrated and some were independent focusing on blue mussel farming and not processing or export. PEI blue mussel farmers have seven different plants where blue mussels can be delivered (PEI Aquaculture Alliance, undated). In Norway there are currently three different processing plants, but several has gone bankrupt since the blue mussel industry was established (Winther et al., 2007).

The structure of the blue mussel industry in Norway today is largely a result of the former policy of granting leases in all the counties, the result being a fragmented industry where recent years effort have been spent on structuring the industry, merging companies and cleaning up sites and leases. Canadian blue mussel farmers did not report such a problem and have instead been able to focus on streamlining production and maximizing the yield.

It seems like the overall structure is quite similar between the two countries, but Norwegian mussel farmers have been forced into restructuring which has taken time, resources and has damaged the production process and the volume produced in recent years. From being an industry of independent blue mussel farmers, several companies in Norway are now either going for an integrated model, or aiming at controlling several leases and up scaling the production. There is consensus among some of the companies in Norway that integration is the only way of being able to have control on the quality and the production. However, most of the lease holders in Norway are still working part time on their leases (Norsk Fiskeoppdrett, 2007 nr 2:76).

6.4 Financing

Figure 2.2 illustrates the challenge for all newly established businesses; the challenge of having a solid economic base which allows the company to do investments and to have liquidity to survive the period of time before the investments start to pay off. However, this is closely linked to the development of a business plan prior to starting the business and shows the importance of good planning, not only at the operational side of the business, but also on the financial side. Duinker et al. (2007) reports a negative image of the blue mussel industry among the financial institutions in Norway.

The companies in both countries tell about difficulties in getting the financials in place when starting up the blue mussel business. Government financial support has been put in place in both countries and played a role in establishing new business and a new industry. Banking as an option to giving financial relief is only mentioned by the Canadian companies, but the respondents in Canada mentioned problems in communicating with the banking sector because the banks did not fully understand the nature of blue mussel farming and the needs of the companies.

The importance of governmental support in financing the business was referred to by both countries. Not just in investments and R&D, but also in supporting the companies in the operating phase.

The liquidity challenge has been severe for many companies in the blue mussel business and none of the interviewed companies gave an impression of an easy task when in need of money for their business. Both groups had the same challenges and the solution has been to spend own money, grow organic and also apply to the government for aid. Winther et al., (2006) sees the financial difficulties in the Norwegian blue mussel industry in context of the problems regarding establishing plants in Norway to process the mussels. Toxic algae and poor quality have led to periods where the plants have been out of mussels, leading to financial difficulties. This has created a reaction back in the value chain, leading to economic problems at the mussel farms.

One of the main reasons for success on PEI could be the fact that the local provincial government took the cost of supplying the mussel farmers with the first processing plant and established a common brand (Søderholm, 1999), enabling the blue mussel farmers to make

money on the mussels and to build the capital in the companies in the initial phase. Such support gave the blue mussel farmers on PEI the opportunity to earn money at their crops at an early stage and opportunity to earn an income. The Norwegian government financial support has largely been focused on grants and risk loans and aimed at input factors such as suspended lines, boats and equipment. Grants and loans have been given on plants in Norway as well, but the lack of a proper organization in the industry has prevented the plants being an integrated part of the whole value chain.

Future financing of the industry in Norway should be conducted in close relationship with the blue mussel farmers taking the experience from Canada into account, the effect of the financing is probably best when the need is identified in cooperation with the organization of the mussel farmers and aimed at giving the industry the opportunity of reaching the market with the products. This generates turnover and creates knowledge among the blue mussel farmers on the production process and the market demands. Duinker et al. (2007) refers to the cooperation between the blue mussel farmers associations and the government identifying the problems to be addressed and where the government money should be targeted. This is a good example of how the financing of the future needs of the industry can be accomplished in Norway. Basic research needs have to be financed and solved before financing of the escalation of the industry can be made.

6.5 Demand in market and geographical conditions

Duinker et al. (2007) enhances the proximity to the European and the Russian markets as an opportunity of the Norwegian blue mussel industry. As shown in chapter 4, most of the Norwegian production is sold to France, and the Canadian production is mainly exported to the US, but the domestic market in the major cities is also important.

Up to now, most of the Norwegian exporters of blue mussels have been focusing their sale on the European market. Europe has long traditions with blue mussels as a part of the diet and countries as France, Belgium, and the Netherlands are big consumers. As explained in chapter 1, Belgium and France are net importers of blue mussels, creating possibilities for countries which are in position to export blue mussels. The Norwegian domestic market consumed 640 tons in 2003 (35% of production) (Johnsen, 2003). Approximately 50-60% of the Canadian production is sold on the domestic market.

Comparing the countries to where the export is taking place from Canada and Norway, it seems like the Canadians have an advantage. The US market which is the single most important export market for the Canadian blue mussel farmers is in relative proximity, have a common language and business culture with Canada. USA has a small domestic production of blue mussels and is relying on import.

Norwegian companies are operating in a relative long distance to the market, which means the transport is costly. The languages are different and the business cultures are also to some degree different than in Norway. Comparing the domestic market in the two countries, it is obvious that the Canadian market is bigger taken the population into account. These are all factors which have to be considered when comparing the success between Canada and Norway.

The European market for blue mussels is described as mature and there are a variety of demands and expectations to blue mussel quality among the different European markets. The Netherlands have been in control of the production and the export of blue mussels in Northern Europe for a long time and have up to now acted in a patronising way, selling Norwegian blue mussels as Dutch when they have been of good quality and as Norwegian when the quality have been poor (Johnsen, 2003). These are challenges the Norwegian companies are facing when they are approaching the European market and it seems like the Norwegians are facing a tougher competition in the market than their Canadian colleagues.

6.6 Technology

Duinker et al. (2007) is referring to different programs in Newfoundland aimed at the blue mussel industry. One of the components in one of the programs was to develop and explore technology and to assist in training. The different programs are put in context with the growth in the development of a blue mussel industry at Newfoundland and are indicating the coherence between the programs and the growth in production volume.

This can also be put in to context with the cooperation between the industry and the innovative system. Linking the industry up with research institutions is improving the capacity of the innovations and thereby improves the competitiveness of the businesses.

All the companies both in Canada and Norway had done some sort of development of technology. Different local conditions demanded a development of the standard solutions provided from the manufacturers of equipment. The possibility of making the operations more effective was also one other motivation to further develop the equipment. A third reason to doing own development was the shifting challenges in the industry, such as the invasive species on PEI. There were simply not machinery ready to put in to action; they had to be built from scratch.

The major differences between the two countries seem to be that the Canadians focus on challenges as the invasive species when relating to the question. The Norwegian focus is strictly at the daily operational level, such as developing suitable equipment for harvesting, socking and measurement of the blue mussel. This might be indicating that some of the Canadian companies have solved the basic challenges and are not concerned about the operational level of the business, i.e. managing socking, timing the spat season and harvesting without breaking the shells. Some Canadian companies were also referring to government programs which were assisting them in getting the right technology and equipment. None of the Norwegian companies referred to such technology transfer programs.

It seems like there is a difference among the two countries in how the business support systems have assisted in supplying the blue mussel industry with equipment. The Canadian companies are reporting of a partnership between the government and the industry where the aim has been to get hold on proper equipment.

A study conducted on the innovation systems in Norwegian aquaculture (Aslesen et al., 2002) is pointing at the fragmentation between the different institutions in Norway, where the knowledge regarding salmon farming is spread among several different institutions and each company not have been able to build a scientific basis for their own business. This might also be a problem for the blue mussel industry because several institutions are involved in R&D and each individual company have not been able to build know-how and experience through operations. At the same time, Norway is spending a lot on resources on marine R&D, in 2003 the total budget for the marine R&D institutions in Norway were 1.7 billion NOK and 1 600 persons were involved in the R&D activities (Aslesen, 2007). Using only a small part of these resources in cooperation with the blue mussel industry on development of technology might seem like a good idea.

6.7 Cooperation and organizations

Other colleagues and different government agencies were among the most common parts referred to as cooperating partners. All the Canadian respondents were referring to some sort of government agency as an important cooperation partner to their operations and business. This was also the case in Norway, as Innovation Norway and the different county administrations were mentioned. On PEI the provincial level had a special status among the respondents as they seemed to be quite involved with the companies and had resources to closely follow up the companies. Such close participation by the government was not mentioned by the Norwegian respondents.

All in all the level of sharing of information among the blue mussel farmers in Norway and Canada seem to be quite good. Some are more open minded than others, but that could just as much be related to the personalities as any strategy of keeping the competitors at arms length. Several of the respondents refer to the benefits of sharing information. By being open and contributing to the others, the whole industry is growing.

Duinker et al. (2007) is pointing at the common agreement in the Norwegian blue mussel sector that there is a need of a blue mussel organization in Norway. Some counties have their own blue mussel organization but there is no national organization in place in Norway. In that context it was interesting to ask both the Canadian and Norwegian companies if they were members of any interest group or organization.

All the Canadian respondents were members of some kind of organization, and it is interesting to notice that the PEI blue mussel farmers organization was founded 25 years ago. Compared to the production statistics this was in the mere beginning of the industry. FHL is a common organization in Norway, but the mussel farmers have taken their time in approaching a common organization.

A proper organization of the blue mussel farmers is probable key to create cooperation between the governmental institutions and the blue mussel business. Identifying the key issues and problems that needs to be explored and solved in the industry can efficiently be done in cooperation between the two parts. A common approach to the identification of the key challenges seem to have been a problem in Norway and the organization of the blue mussel

farmers have taken a long time compared to the industry in Canada. This could also be another reason to the slow development of the blue mussel industry in Norway.

6.8 Government strategy

Duinker et al. (2007) is pointing at the need to work in a long term perspective with the blue mussel sector in Norway and thereby have a long term strategy to create a viable industry. This is also seen upon in conjunction with the decline of the population in the rural areas in Norway and the fact that the Norwegian government has prioritized new marine species in their government declaration document (the Soria-Moria statement).

In this perspective it was interesting to ask if the blue mussel farmers knew of any government strategy towards the blue mussel sector. The assumption behind this question was that the Canadian success in blue mussel farming could be the result of a long-term strategy between the government and the industry. None of the companies in Canada and Norway knew about any government strategy towards the blue mussel industry. Some of the Canadian companies on PEI mentioned a strategy to fight the tunicate invasion, but none was aware of any overlaying strategy which had a steering effect on the industry. This is surprising since the Canadian industry, especially on PEI, has grown to having such impact on the economy of the island.

In Norway it was expected that the respondents not would know of any such strategy since there has not been a common government strategy towards the industry. However, there are several government institutions which have contact with the industry and are implying regulations or sanctions on how the industry has to conduct its business. The Directorate of Fisheries, The Norwegian Food Safety Authority, The Norwegian Coastal Administration, the different municipalities and others such as the different counties and Innovation Norway are all in contact with the industry and have an impact on the development of the industry. Given the complexity and the prior problem in the industry, it is not likely that the Norwegian industry can develop without a common strategy towards blue mussel farming. However, the blue mussel industry has not developed an internal plan on the further development of the industry either (Winther, 2007).

6.9 Industry and business support systems

Duinker et al. (2007) are in the article pointing at the success in the blue mussel business at Newfoundland after the government and the blue mussel farmers worked together and focused on the right tasks and put in action plans to identify the problems and deal with them.

It seems like all the Canadian respondents are pleased with the cooperation between the governmental institutions and their companies. The answers from the respondents are mainly focusing on how they have worked together to solve different difficulties and issues which came along when building both the companies and the industry. On PEI the respondents are pointing at the cooperation with the provincial government and their employees. It seems like the people employed at the provincial government and working with the blue mussel farmers on PEI have a good reputation among the mussel farmers.

One of the respondents is also in his answer focusing on an interesting service PEI is offering the blue mussel farmers. The local authorities are monitoring both the available amount of seed in the waters and the occurrence of toxic algae. Blue mussel farmers on PEI can dial an 800-telephone number and get an idea of the right timing when it comes to putting out the seed collectors. They also have a tool to plan their harvest by knowing when the toxic algae are present in the waters. This is important tools to the growers as they can plan and time their activities to minimize labour and maximize the yield.

This thesis indicates that most of the interviewed Norwegian companies are in dialogue with the government, but the business support agencies and the regulatory systems are not tuned in to give adequate support to a new industry. R&D tasks are abundant and if the industry is going to succeed in the future, the tasks have to be identified and solved in a system where both industry and government are agreeing on the framework, responsibility and future expectations.

7 Conclusions

This thesis examined the blue mussel industry in three regions in Canada and compared the development there to the development of the industry in Norway. The purpose being to compare how the two countries have overcome challenges and bottlenecks in blue mussel farming and to perhaps shed some light on why the blue mussel industry in Norway has failed to grow at the same rate as in Canada. There are both similarities and differences between the two countries. It is difficult to generalize the findings with such a low number of respondents. This is further compounded by the fact that Canada has several provinces with different practices regarding governmental support and organization, making it difficult to draw any definite conclusions from my work. However, it is safe to say that the blue mussel industry in both countries has encountered many bottlenecks.

There are a number of differences in approach between the two countries which could be responsible for the dissimilar levels of success. Firstly, the organization of the industry on PEI as a cluster at an early stage was a real advantage, both to the industry itself, but also to the governmental institutions which in their contact with the blue mussel industry having one forum for discussions to take place and a united industry, makes it easier to identify the challenges and react with the most suitable measures towards the challenges.

Creating such an organization in Norway has proven to be a real challenge. We can merely speculate as to why this has occurred; it is likely that the extensive geographical distances between the Norwegian counties is a major contributing factor. The formation of local blue mussel associations has, in my opinion, led to a geographical battle for government money and strategic positioning which has not been in the long term interest of a national industry leading to fragmentation in the industry .

Financing has been a bottleneck in both countries. Government funding is vital in both countries. There have been problems with a lack of understanding in the banking sector about the challenges which the industry faces, leading to a lack of funding?. in the current economic climate in Norway, it is unlikely that banks will take the risk on the blue mussel industry. Financial crisis combined with the uncertain nature of blue mussel farming makes it difficult to mobilize capital for investments, in getting capital on investments and management. It is probable that in the future, financing of investments will to a large extent come from private investors until the industry can prove viability and has a sufficient degree of knowledge and

routines to manage the sites effectively. It was a surprise that none of the Canadian provinces had a strategy towards blue mussel farming. I had expected this to be the case on PEI where the growth in the industry has been so fast. Accomplishing this without any kind of strategy is impressive. However, the need for a common strategy is less urgent if the industry is well organized. This was the fact on PEI when the industry organization was established 25 years ago. It is unlikely that the Norwegian industry can develop as quickly without a strategy, taking into consideration the fact that some of the major companies just have become members of FHL.

Research done in Canada shows that the blue mussel production in the rural districts annually generates 2,38 man-labour years per 5 million NOK in turnover. A study done on PEI indicates that the turnover from the farmers on PEI is approximately 30 million NOK, but the total value of the industry is estimated to be 100 million. This includes local deliveries, taxes, etc. (Duinker et al., 2007).

A crisis like the tunicate invasion on PEI shows the importance of having a support system for the industry, given the economic importance of the activity the industry generates. The blue mussel industry on PEI is facing a serious challenge with the tunicates, this could be detrimental to the industry on the island, if it continues to spread and ways of removing the on-growth in a cost-effective way are not found.

Norway has spent major resources, both private and governmental, on the blue mussel sector since the 1980s. Despite this, several companies have either gone bankrupt or closed down operations. The large number of leases and the low production and export volume are indicating some weaknesses in the industry. Several blue mussel processing plants have been established and have closed down later on, which is one other indication on the problems.

The new directive on hygiene coming from the EU will demand a lot of investment from both government and farmers. Norwegian authorities also plan to ban toxicity testing on mice. This is a threat to export of blue mussels to Europe as EU countries do not accept chemical testing (Nodland, 2008). The Norwegian Coastal Administration has demanded marking on all blue mussel leases along the Norwegian coast, which will be a financial weight on the mussel companies. The Ministry of Fisheries and Coastal Affairs has also been working on a system of economic guarantees from the lease holders to ensure a clean-up in case the companies go into bankruptcy (Norsk Fiskeoppdrett, nr 3 2008:18). These are all challenges

where the Norwegian authorities must work alongside the blue mussel farmers and their organization to create solutions. It highlights the need for dialogue with the government, such as a blue mussel farmer's organization, where such issues can be discussed and resolved.

All the companies both in Canada and Norway have worked on developing proper equipment to fit their operational needs. This is a major challenge for the industry and exemplifies the difficulties which they are facing, compared to agriculture for instance where most tools are already developed. It also shows the need to link the blue mussel organizations with research institutions to identify needs and find solutions to maximizing the speed of the development process and minimizing the costs for each company. Government funding must play a role in R&D activities, but it is likely that getting the best effect out of each project can only be achieved by coordination through a common organization. Proper problem identification and maximising the learning of each R&D project should be prioritized when using public funds on blue mussel farming.

Regarding market and prices, most of the Norwegian companies are shipping mussels in bulk to Europe. All of the Canadian companies deliver to local processing plants, which have their market in the US and Canada. Having a developed industry makes this possible on PEI as there is a stable supply of blue mussels all year round. However, the first production line on PEI was supplied by the provincial government, whereby highlighting the importance of cooperation between government and private companies. Such a solution seems impossible in Norway because of the EEA agreement, which regulates the amount of subsidies that can be given to companies in the EEA area.

Norwegian companies have to deal with a different type of competition than their Canadian colleagues. The European blue mussel market is developed and has a long tradition. Norwegian companies are fragile, new to the market and have had problems related to continuity in the shipments.

It could be a better strategy to develop the domestic market first, prior to entering into competition with the more experienced companies in Europe and having to deal with several different quality preferences and languages. Snadder & Snaskum is the only Norwegian blue mussel company which is in profit (Lydersen, 2007) and is strictly focused on the Norwegian domestic market. This could be one explanation as to why the company has survived the ups and downs in the industry. Individually going towards the blue mussel market in Europe, the

Norwegian companies are fragile and small. However if they stick together when competing with well organized and skilful trade partners in the Netherlands, Belgium and France, they could be more competitive. Cooperation among the companies could also secure the deliveries in periods when there is toxicity and other issues in the different mussel growing regions in Norway. The problem with algae related toxicity in both Canada and Norway highlights the importance of having several companies in different counties working together. Norway has a tremendous coast line and the likelihood that the entire coast should face a ban on harvesting because of DSP or PSP is quite small. A future strategy of cooperation seems like the only viable strategy, given the status of the Norwegian industry today, but this can only be accomplished if the Norwegian companies see the benefit of cooperation.

As a final comment, due to the differences between the industry in Canada and Norway, it has been a challenge to draw conclusions on how the blue mussel farming should deal with bottlenecks and barriers. In any future work, it might be interesting to have a closer look at the Norwegian blue mussel companies and how they look at the industry and what plans they have to overcome challenges, cooperate and what kind of specific knowledge they have on mussel farming. Such a study could be the basis of a future strategy of the blue mussel farming in Norway.

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Appendix 1 Questionnaire to blue mussel companies

Interview guide blue mussel farmers

1. Info on the informant

Name
Position
Background

2. Key information on the business

Localization
Established
Number of employees
Production volume
Turnover
Number of leases
Ownership

3. Background

Why did you start with blue mussel farming?
Who took the initiative to start up?
What qualifications did you have to start with blue mussel farming?

4. Development of the business

How has the business developed since the start up?
How did you finance the initiative?
Is the business established based on existing technology, or did you have to develop technology on your own?

5. Sales/marketing

Who are you customers?
What kind of sales/market channels do you use?
How would you describe the development in the prices on blue mussels?
Do you receive any government financial support to market blue mussels?

6. Cooperation partners

Who have been the most important collaborating partners (most helpful) during the development of the business?
What has been their contribution and in what way have they contributed?
What kind of relations do you have to these/them (formal/informal?)
Are you member of a growers association (why, what use)?
In what degree is there openness and sharing of information between those who are in the blue mussel farming business?

7. Challenges

What have been the greatest challenges for you since starting up the business (capital, know-how, biology, technology, market, recruiting people, governmental regulations, etc.)?
What have you done to face these challenges?

Have you received any kind of government funding or support?

Who would you describe as your fiercest competitors?

Are there still some bottlenecks that you are struggling with?

8. Government support

Do you know if the government/province government has any strategy towards the blue mussel industry?

How would you describe your cooperation with the governmental authorities?

Is there any kind of support that you are missing?

9. Future

What main challenges do you see in the future for the blue mussel industry?

Appendix 2 Questionnaire to organizations

Interview guide to public business support system and organizations

About the source

What organization do you represent?

Short on your background

What's your main task in this position/job?

About the organization

What's the main task of your organization?

How many are working on shellfish/mussel related issues?

Do you have the opportunity to contribute financial to the blue mussel industry?

About the contact with the blue mussel industry

How do you work towards the blue mussel industry (farming, processing plants, etc.)?

Do you have any strategy/policy for the work towards the blue mussel industry?

Is this policy drawn up in contact with the blue mussel industry and perhaps other government agencies?

How would you describe the cooperation between the blue mussel industry and the governmental/public support system?

How would you describe the political interest for mussel growing and new marine species?

What is your most important contribution to the mussel farming/industry?

Status and challenges for the industry

How would you describe the general development of the blue mussel industry in your region so far?

What, in your opinion, have been the biggest challenges so far (capital, know how, biology, technology, market, recruiting, governmental regulations, etc.)?

What have you done to handle these challenges?

What have went well in the blue mussel industry?

What have so far gone wrong in the blue mussel industry?

Why do you think it's so?

Future

What do you see as the most important challenges in the industry in the future?

What do you do to prepare the industry for these challenges?