

# Growing our Future



  
**NOVA SCOTIA**  
Agriculture and Fisheries

February 2005

**Long-Term Planning  
for Aquatic Farming  
in Nova Scotia**

A Discussion Document

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## Ministers Message

Over the years aquatic farming in Nova Scotia has faced many challenges and celebrated many successes. We have reached a critical point in the industry whereby government must ask the question, “ How do we successfully grow this industry? We need a plan.

I hope you will participate in this discussion document. I want to hear your comments.

The Nova Scotia Department of Agriculture and Fisheries is seeking public consultation on the future of the aquaculture industry. This discussion document entitled “Growing our Future: Long-Term Planning for Aquatic Farming in Nova Scotia” is available to the public for review.



Comments may be sent to the department by:

E-mail: [aquaculture@gov.ns.ca](mailto:aquaculture@gov.ns.ca)

Mail:  
Aquaculture Division  
Department of Agriculture & Fisheries  
P.O. Box 2223  
Halifax, Nova Scotia  
B3J 3C4

Fax : (902) 424-1766 Attention: Public Consultation.

We will review all submissions during the consultation phase, February 1 - March 31, 2005. These comments will contribute to a comprehensive Aquaculture Development Strategy to be released in 2005.

Thank you for your time.

A handwritten signature in black ink, appearing to read "Chris d'Entremont". The signature is fluid and cursive.

Chris d'Entremont  
Minister

## *Preface*

The first Nova Scotia Aquaculture Development Strategy was drafted in 1996 and provided a framework for aquaculture development which was responsive to the needs of the industry at that time. A revised strategy was prepared in 2000 by Rogers Consulting Inc. Since 2000, significant pressures have come to bear on aquaculture development in Nova Scotia which were only beginning to affect the industry in 2000. These include global market competition (particularly from Chile in the salmon sector) and a resultant drop in commodity prices, disease threats such as ISA and MSX, the implementation of the *Canadian Environmental Assessment Act*, continued lack of an aquaculture business risk management plan, and more recently, invasive species and a depressed American currency relative to the Canadian dollar.

Significant progress has been made on some of the constraints identified in the 2000 strategy document, particularly in the areas of environmental monitoring, the development of a Federal aquaculture strategy, research in the development of vaccines and developing species husbandry. At the same time, many of the problems facing the industry five years ago are still restricting the full potential of the industry. These include an onerous and expensive leasing/licencing system, continued insufficient lease tenure period, competing interest groups, and inability to access capital or support programs offered by competing provinces or other industries such as agriculture.

As a result of these pressures, senior management decided it was important to include an updated Aquaculture Development Strategy in the 2003–04 NSDAF Business Plan. In order to capture the concerns and needs of the industry, regulators and the other coastal community stakeholders, a discussion document was drafted to identify a comprehensive list of issues related to aquatic farming in Nova Scotia and propose a vision for aquaculture:

*Aquaculture is recognized as an economically sustainable and environmentally responsible industry that provides high quality seafood products for domestic and export markets. Coastal communities welcome and respect aquaculture farms as an integral part of traditional activities that create employment and provide opportunities for social and economic growth. The government of Nova Scotia is recognized as providing a positive stable climate for industry growth while at the same time fulfilling our obligation to protect the environment for future generations.*

The discussion document was endorsed by the Minister in November 2004, along with a comprehensive consultation plan and communication plan to ensure the discussion document would be reviewed as widely as possible. The goal of this phase of the new Aquaculture Development Strategy is to partner with industry and government stakeholders to identify issues, needs and solutions, and obtain feedback from identified stakeholders and the general public. The consultation plan includes direct mailing of the document to lease holders, workshops with federal/provincial regulators, industry associations and academic partners. Special interest groups and the general public will be engaged through the Departmental website. This vision document will be rolled out in February and a period of two months will be provided for feedback.

Following the consultation period, the Department will prepare a list of recommendations. These recommendations will be reflected in a new Aquaculture Development Strategy. The strategy will focus the financial and human resources of the Department of Agriculture and Fisheries towards fostering the successful development of aquatic farming in Nova Scotia.

## 1.0 Introduction

Rural economic growth is important for Nova Scotia. Many communities are suffering the effects of out migration, a declining business sector, a decreasing tax base and few opportunities to entice young people to stay or return for work. This reality is familiar to many Nova Scotians and represents a real challenge for government. In today's world it is difficult to find economic activities, beyond the traditional ones, that need or want to locate in rural areas. This fact is evident in the continuing trend of urbanization that is sweeping not only Nova Scotia, but also Canada and much of North America.

An ideal industry for rural economic growth in Nova Scotia would have the following characteristics; a rural location, utilizes existing natural assets, is sustainable, generates export revenue, offers "smart jobs" that can attract or retain young people, provides spin-off benefits for local businesses, and integrates well with the traditional rural activities and way of life. Not many industries or business opportunities fit this formula. One that does is aquaculture, also known as aquatic farming.

Aquaculture is defined as farming of aquatic plants and animals in water. It is the fastest growing animal food production system in the world. It parallels the transformation that took place in terrestrial food production thousands of years ago. Namely the rise of farming as the primary means of food production over hunting and gathering. Globally, it is recognized as the primary means to meet increasing demands for seafood, given that the world's commercial fisheries are close to their production limits. The United Nations and governments around the world, including Canada and the United States have advocated their support for expanded development of aquatic farming.

In Nova Scotia, a relatively small but highly competent aquaculture industry exists. It has a low profile (given its small size and geographic distribution) however, experience shows that aquatic farms can integrate well in communities and become valued as important economic contributors. Aquatic farms draw employees from the surrounding communities and in some cases are the largest or only local employer. Many jobs on aquatic farms are year-round, which provide stability for rural workers who often must rely on seasonal work and Employment Insurance to provide an annual income. With appropriate government support aquatic farming can grow in Nova Scotia to the benefit of many rural communities.

From a provincial perspective, aquaculture is a natural fit for Nova Scotia. The province has abundant clean water resources (salt and freshwater), a capable workforce and most of the required infrastructure. We also have a tradition of people earning their livelihoods from the production and export of seafood. Nova Scotia is Canada's largest fish exporter and enjoys a global reputation for high quality products. As an industry that complements rather than competes with traditional fisheries, aquaculture benefits from many of the existing business relationships, supply chains and transportation links. Aquaculture offers an opportunity to diversify our traditional seafood industry and stay current with changing trends in seafood production and consumption.

Despite the obvious advantages that Nova Scotia has for supporting aquaculture, the industry is currently underdeveloped and potential investment in the industry is going elsewhere. Why? Nova Scotia has a reputation for having an unsupportive and unstable business and regulatory climate for aquaculture development. Aquaculture is not fully recognized as a legitimate user of aquatic

resources and is often opposed by other users such as waterfront landowners, recreational users, and the commercial fishery. It is constrained by a legal and policy framework that is not supportive of and accommodating to aquatic farming. It faces intense environmental scrutiny that is generally more about perceived risk than actual harm. In the past, government support and programs have not been adequate to sustain industry development. Immediate action is required on the part of governments, federal and provincial to improve the business and regulatory climate for aquaculture in Nova Scotia. We cannot afford to repeat failed development initiatives that have resulted in lost economic opportunity for Nova Scotians.

The government of Nova Scotia supports aquatic farming based on its merits as a sustainable rural economic activity. The government is committed to the growth of

aquatic farming in Nova Scotia and prepared this discussion document as the first step in a coordinated effort to create a positive development climate. This document will explain the current status of aquatic farming, the opportunities and challenges for Nova Scotians, and lay the foundation for a successful Aquaculture Development Strategy.



## 2.0 What is Aquaculture?

Simply, aquaculture is farming in water rather than on land. There are many types of aquaculture but all share several common features. The United Nations Food and Agricultural Organization (FAO) defines aquaculture as:

*“Aquaculture is the farming of aquatic organisms, including fish, mollusks, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated”.* (FAO Glossary).

Modern aquaculture in Canada is similar to the agri-food production model used in terrestrial farming. In this system, crops (plants or animals) are propagated and raised as private property of the farmer. Once the crop attains the

desired market size and condition it is harvested, processed and sold for human consumption. During this time various federal and provincial regulations are followed to ensure food safety, animal health and environmental sustainability.

This model of food production was developed over centuries in agriculture. It represents a fundamental transition from hunting and gathering to farming as the primary means of food production on land. Agriculture has been developed and refined to improve husbandry practices, productivity and to minimize environmental impacts over several centuries. Today land based food production is overwhelmingly based on farming rather than hunting. In contrast, seafood is primarily supplied by fishing and remains a hunting and gathering activity. Perhaps the only place in a grocery store today that you can find products

from hunting activities is at the seafood counter. The emergence of modern aquaculture is changing the way seafood is supplied. In a modern way it parallels the transition from hunting to farming that took place on land thousands of years ago.

This transformation in seafood production has been called the “blue revolution” and closely compares with the “green revolution” in agriculture that occurred on thousands of years ago. (The Economist 2003). Aquaculture is expected to continue growing and provide an ever increasing share of global seafood production. That expectation is based on the fact that global demand for seafood is rising yet the world’s commercial fish stocks appear to be at their biological production limits. Future growth in seafood supplies is expected to come from aquaculture sources.

Equally important for the continued growth of aquaculture is the fact that farm raised seafood can be grown to suit sizes, colour, and other qualities desired in the marketplace. Moreover, it can be supplied on a year-round basis relatively free of restrictions imposed by bad weather or regulated seasons or variability of wild stocks. Aquaculture is an ideal method of seafood production in today’s society where healthy eating, food safety, and consumer convenience is paramount.

*“By 2030, aquaculture is expected to be the dominant source of fish and seafood; and less than one-half of all fish and seafood products consumed will originate from traditional capture fisheries.”*

Yves Bastien, Federal Commissioner for Aquaculture

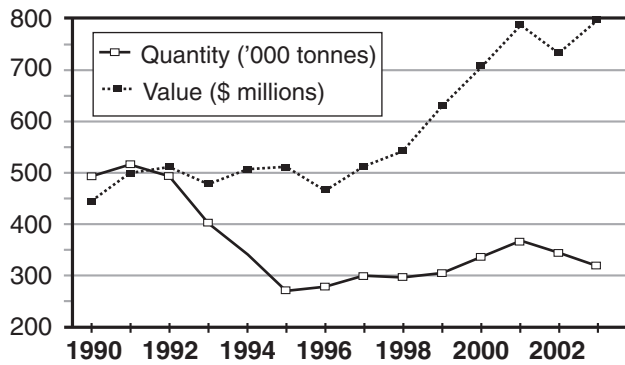
### 3.0 Global Seafood Production

Global seafood supply from capture fisheries has been relatively stable around 90 million tonnes per year since the late 1980's. Considering only 25 per cent of the world’s major commercial stocks are considered under exploited, experts believe that capture fisheries may have reached their maximum sustainable production (OCAD 2003). Aquaculture is seen as the best opportunity to meet the increasing global demand for seafood products.

Since the early 1990's, the quantity of fish landed in Nova Scotia decreased due to the collapse of many groundfish stocks. The overall value of the fishery increased, however, as effort shifted to higher value shellfish species. Since the collapse in the early 1990's, groundfish stocks have not recovered and moratoria remain in effect. The value of fisheries landings today is concentrated in four shellfish species, lobster, scallop, crab, and shrimp. These species accounted for over 80 per cent of the total value in 2003. Several of these stocks have been at historic high levels in recent years. While they are not expected to collapse, shellfish populations are cyclical in nature and decreases in some stocks are likely to occur in the future. Increasing aquaculture production is a good way to diversify the Provinces’ seafood production.

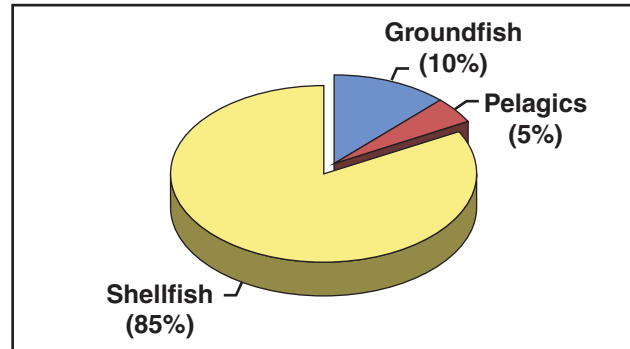
<b>Status of Major Marine Fish Stocks</b>	
<i>Source: FAO 2002</i>	
Moderately or under exploited	25%
Fully exploited	47%
Over exploited	18%
Depleted or recovering	10%

**NS Fisheries Landings**  
1990 – 2003



Source: DFO

**2003 NS Fisheries Landings**  
by Value



Source: DFO

## 4.0 The Rise of Aquaculture

On the global scale, the rise of aquaculture as an important food production source for humans has been rapid. From 1970 to 2000, aquaculture's contribution to world fish supplies increased from 3.0% to 27.3% (FAO 2002). This represents an average compounded increase of 9.2% per year since 1970. Compared to growth in capture fisheries at 1.4% and terrestrial meat farming at 2.8%, aquaculture is growing more rapidly than all other forms of animal food production (FAO 2002). In 2000, more than 210 different aquatic plant and animal species were reported to be under cultivation (FAO 2002). Asia dominates world aquaculture production, accounting for 87% by weight (Delgado et al. 2003). In 2000, more than half of global aquaculture production was finfish followed by molluscs, aquatic plants and crustaceans. Growth in the production of all species groups continues to be rapid (FAO 2002).

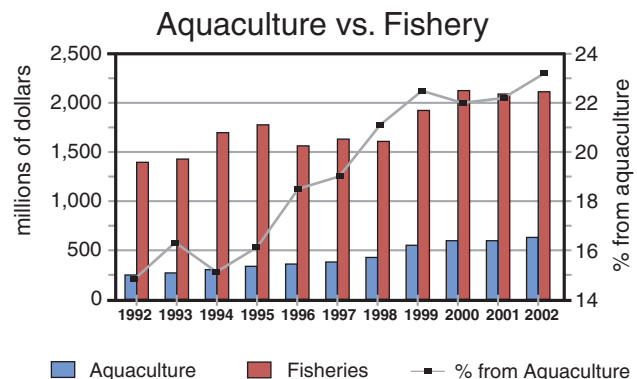
*"Without aquaculture growth our company would not be able to build our food business. We are very dependent on aquaculture for growth. We are a huge buyer of aquaculture... we understand what the customer wants."*

Derrick Rowe, CEO  
Fishery Products International

yet these species accounted for 39% of all export revenue generated from fisheries. Atlantic salmon represents almost half of global high value finfish production (Delgado et al. 2003). High

value finfish is the only production category that is dominated by developed countries. In 1997 these countries accounted for 76% of high value finfish production, mostly trout and salmon. Norway, Chile, the United Kingdom, Japan and Canada are the largest producers (Delgado et al. 2003).

### Value of Canadian Seafood Production



The production of high value finfish species such as salmon, trout and sea bream is small by volume but generates significant export revenue. In 1997, only 5% of global aquaculture production was high value species,



## 5.0 Nova Scotia's Case for Aquaculture

Nova Scotia has many inherent features that make it a good place for aquaculture development. In addition to good growing areas, a capable work force, established transportation links, processing infrastructure, strong government and R&D support, Nova Scotia's proximity to the U.S. market, provides distinct regional advantages.

### 5.1 Nova Scotia's Geographic Advantage

Nova Scotia's geographic advantage is enhanced by the range of habitats that are present. We have an environment that can support a diverse and vibrant aquatic farming industry. From a geographic perspective there is still significant potential for growth in the aquaculture industry in areas such as the Eastern Shore and parts of the Northumberland Strait and Cape Breton Island. There are freshwater resources in parts of the province which offer opportunities for hatcheries and other freshwater aquaculture operations. Each aquatic species has its own biophysical requirements. Some growing areas are good for certain species but not others. In spite of this, many areas are not suitable for growing any farmed species and are not candidates for development. Conflict with other coastal resource users has been a challenge to new aquaculture development.

Awareness of Nova Scotia's aquaculture potential has heightened in recent years as development in neighboring provinces has matured and the best growing areas are fully utilized. The recent expansion into this province by mussel and salmon farms from P.E.I. and New Brunswick respectively is tangible evidence of the natural potential that exists in Nova Scotia.

### 5.2 Human Resources, Training and Education



Aquatic farming relies on workers with a diverse range of skills and training. As a science based farming industry, workers with a range of academic, vocational and practical skills are required. Nova Scotia is perfectly suited to provide these workers considering we have one of the most highly educated populations in the country and more post-secondary institutions per capita than any other province. Several of these institutions offer marine and aquatic programs. In addition many potential farm workers have experience in commercial fish harvesting and processing which provides them with some of the skills required for aquatic farming.

Nova Scotians also have access to specialized aquaculture training. The Nova Scotia Agriculture College in Truro is the only institution in Atlantic Canada offering undergraduate and graduate degree programs in aquaculture. The Nova Scotia Community College, Shelburne Campus, offers a one year diploma course to train people in the practical aspects of operating an aquatic farm. Both institutions actively work with the industry to address their educational and research needs.

### 5.3 Seafood Tradition



Nova Scotians have a tradition of earning their living from the sea. We are the number one seafood exporting province in Canada, \$1.2 billion in 2003 and enjoy a global reputation for providing top quality products. This offers advantages for aquatic farming. Supply and distribution chains for seafood products are in place. Transportation links already exist and there are many longstanding business relationships between Nova Scotia companies and those in major export markets. A capable and experienced workforce exists in the province that is oriented toward the production and export of seafood. In many ways, aquaculture is an opportunity to expand and diversify one of the provinces most traditional economic activities - the production and export of seafood.

*"Farm raised seafood is an important part of the seafood business today, and a growing percentage of products sold at our seafood counters come from farms. Products such as salmon, shrimp, mussels and oysters are considered staple items. Farm raised halibut, haddock and cod may soon be on the shelf as regular items as well."*

Naomi Matthews, Director Seafood  
Sobeys Atlantic Region

### 5.4 Knowledgeable and Experienced Industry



A knowledgeable and experienced aquaculture industry one of Nova Scotia's most important assets. Nova Scotia's aquatic farmers grow top quality products and are globally competitive. Many can trace their activities back to the earliest days of aquaculture development in Canada. Nova Scotians pioneered a number of the successful aquaculture methods used today. Those in the industry have overcome many challenges and are recognized nationally and internationally as leaders in their field.

In recent years they have been joined by successful producers from other provinces who have identified Nova Scotia as a good place to expand their businesses. Together they represent an experienced and capable industry that can drive future growth, with proper government support, in a productive and sustainable manner.

### 5.5 Supply and Service Sector

With a number of marine industries based in the province, a well established network of companies exists supplying goods and services. Many can provide general services such as the construction and repair of boats and machinery, supplies of rope, clothing and other marine products along with professional services such as insurance, legal and technical consulting expertise.

A number of businesses offer specialized goods and services for the aquaculture industry. A national aquaculture suppliers guide lists 96 companies in the province offering goods and services to the industry (Sustainable Canadian Aquaculture 2004). These include, fish feed, equipment manufacturers and suppliers, rope and buoy suppliers, insurance, consultants, hydraulic and electronics, packaging, financiers, clothing and safety equipment.

### 5.6 Research and Development (R&D)



The province has special expertise in ocean-related research and one of the largest concentrations of marine scientists in the world. It is a regional center for aquatic and marine research and has several world class institutions. In addition to eleven universities located around the province, the Bedford Institute of Oceanography (BIO), and the National Research Council - Institute for Marine Bio-Sciences (NRC-IMB) are located in the

Halifax Regional Municipality. The Nova Scotia Department of Agriculture and Fisheries and federal Fisheries and Oceans also have many staff with specialized knowledge and research capacities.

### 5.7 Business Support and Financing

A number of government agencies offer business support and lending programs for aquaculture in Nova Scotia. These include: the N.S. Department of Agriculture and Fisheries Loan Board, Agriculture and Agri-food Canada, Atlantic Canada Opportunities Agencies (ACOA), Farm Credit Corporation (FCC) and the National Research Council's Industrial Research Assistance Program (NRC-IRAP). Programs and activities vary between agencies but all include aquaculture in their mandate. The Department could support aquaculturists more by promoting the use of in-house business planning professionals typically used by the agriculture sector.

A key component missing from the financial support network is a business risk management program which would provide for loan guarantees, income stabilization, risk management and risk remediation, and support from catastrophic losses due to weather or disease. Traditional land-based agriculture has relied on such support for long-term economic sustainability. This shortfall has been identified by the industry associations and at the national level by the federal government (OCAD, 2004). The Aquaculture industry has long advocated the inclusion of aquatic species under the Agriculture Policy Framework which would provide the same benefits land based farmers enjoy in the areas of food safety and quality, environmental programs, science and innovation, renewal, and business risk management.

## 6.0 Opportunities for Development

### 6.1 Increase Utilization of Existing Leased Areas

A successful aquaculture strategy creates the climate in which aquaculturists can succeed and grow, and ensures that aquaculturists have access to information, training and research resources to make well-informed business decisions. Nova Scotia's aquaculture output can be substantially increased by developing operations in inshore leased areas that are currently under-utilized. Improving on the regulatory and development climate that exists in the province, and developing a strategic focus for aquatic farming in Nova Scotia can make it easier for aquaculturists to fully utilize leased aquaculture areas. The province must work more closely with underutilized lease owners to provide the necessary extension service, business plan development, or continuing education opportunities that will assist them to more fully realize their production potential. The specialized aquaculture training and research provided by the Nova Scotia Agriculture College in Truro and the Shelburne Campus of the Nova Scotia Community College can provide aquaculture operators with the skilled labour, knowledge and technology needed to expand and take advantage of Nova Scotia's existing aquaculture areas.

### 6.2 Diversification



The opportunity exists for Nova Scotia to take a lead role in the development of so called "whitefish" species as cod and halibut. There are suitable grow-out sites available for either species and a Nova Scotia firm is considered a world leader in the production of juvenile halibut. The current

instability in the salmon market has slowed development of halibut as salmon farmers who may have ordinarily offered cage space for halibut growout are now consolidating operations and reducing risk. There is some preliminary development work occurring with Atlantic cod in Nova Scotia, but unless the Province and lending institutions offer support for initial capitalization, neighboring provinces such as Newfoundland will seize this development opportunity.

There is great potential in the development of shellfish species other than mussels and oysters. Utilizing areas currently classified as "closed" under the Canadian Shellfish Sanitation Program (CSSP) regulations could dramatically increase the production of soft shelled clams and quohogs. Partitioning this resource between shellfish farmers and traditional commercial harvesters will be a challenge however.

### 6.3 Technology

Aquaculture currently finds itself at a cross roads between the present level of production potential



and the ability to increase its share of the global market. Many inshore sites are not suited to the scale of production that is currently the norm and that will only continue to increase into the future. There is currently scarcity of deep water inshore sites due to competition for space amongst a variety of users. Offshore aquaculture would avoid the not-in-my-backyard (NIMBY) syndrome often expressed by inshore stakeholders. However, the technology for offshore aquaculture is very expensive. Once Nova Scotia's inshore areas near capacity, substantial increase in aquaculture output will require expansion in more exposed and offshore

areas. Development of the sector in exposed and offshore sites will require a development approach different from what currently exists due to the increased capital outlay risks associated with the harsher environment and reduced access to the site.



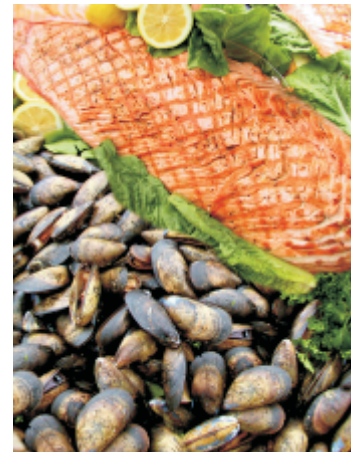
In addition to moving offshore, there are other technologies that present opportunities for the aquaculture sector. Recirculation technology is in limited use in Nova Scotia as it is typically cost-prohibitive for the species currently cultured. Recirculation or partial recirculation may become an option if an advance in technology or regional technological advantage such as a subsidized heat (access to cooling water from a power generating plant) or power source becomes available. A favorable foreign exchange rate or an increase in the market price of a species uniquely suitable to Nova Scotia would also foster an advantage for recirculation. It should be recognized however, that conditions conducive to profitable aquaculture using recirculation technology (other than offered by a regional technical advantage) may become a significant disadvantage to Nova Scotia as these systems could then be built anywhere to take advantage of adjacent markets, labour force or processing facilities. On the other hand, recirculation technology is recognized as being more environmentally favourable than flow through or net pen systems as wastes may be collected and processed similarly to other livestock. While recirculation

technology presents significant risks associated with disease, power disruptions, etc, other risks such as predator control and environmental damage are reduced or eliminated.

Other technologies in limited use that could present opportunities for the sector include an off-bottom bag or tray system for farming oysters and the continuous socking method for farming mussels. Disposable or biodegradable double socking techniques for reducing predation by sea ducks would be of great benefit in some areas. Modified Atmosphere Packaging (MAP) provides an opportunity for value-added aquaculture products and improved shelf-life to reach more distant markets.

#### 6.4 Marketing and Value Added Products

Nova Scotia aquaculture has both the advantage of being in close geographic proximity to the large U.S. market and having established traditional links and chains of distribution with the New England and New York markets. Nova Scotia aquaculture farmers also have NAFTA acceptance into the U.S. market. This provides incentive when attracting investment in Nova Scotia operations. The proximity to the U.S. and the small size of Nova Scotia operations also allows Nova Scotia producers to react more quickly to changes in market conditions in the U.S. As well, proximity to the U.S. market allows Nova Scotia aquaculture products to reach the market fresher than products from other locations, and provides producers with the highest rate of return. However, competition from cheaper but high quality vacuum frozen Chilean salmon poses a threat to traditional



fresh salmon markets in the US. Developing a North American organic certification system, similar to that used in the European market, would allow Nova Scotia ocean-based producers to receive a premium price in the U.S. market. These advantages also provide opportunities for Nova Scotia producers to aggressively market their products in the U.S.

Nova Scotia has a critical mass of researchers and scientific infrastructure to conduct significant scientific research projects that have the potential to be directly connected to consumer market activities. However, there is

currently very little value-added processing or packaging of aquaculture products occurring in Nova Scotia. New, small aquaculture companies have not yet reached the stage where they are processing their product. Areas of potential opportunity include pre-packaged fish or meals; nonperishable packaging for gift markets, online or mail-order services; new food products that promote better health, certified organic products, high quality, safe and traceable products and easy-to-prepare products, bio-fuels “ingredient” products, and nutraceuticals.

## 7.0 Sustainable Aquaculture and the Environment



Aquaculture is an inherently efficient method of food production that is environmentally sustainable. It is highly productive and compares favourably with other means of food production. Many of the criticisms of aquaculture are exaggerated or not relevant to the manner that aquatic farming is practiced in Nova Scotia. Exaggerated or misleading environmental arguments are often used to oppose aquatic farm siting decisions. Whatever the reason, the recent negative focus on aquatic farming has eroded public confidence and support for aquaculture.

All forms of intensive food production have environmental costs. Commercial fishing requires vast areas of ocean space and removes hundreds of thousands of tonnes of biomass from marine ecosystems each year. In agriculture, the creation of a field or pasture typically requires the removal of native plant and animal species from the area. As indicated by the federal Commissioner for Aquaculture Development in his report, *Achieving the Vision*, agriculture practices continue to have direct and indirect consequences for the surrounding environment, yet it enjoys public support. Animals farmed in the water should enjoy the same kind of public support.

Nova Scotians accept these necessary activities as no one expects to hunt and gather the food they require. Such an approach would obviously not be sustainable. It is the responsibility of the Government to ensure that food is produced in the most environmentally sustainable way possible. In that regard aquatic farming deserves the full support of government and society as an efficient and responsible means of human food

production. In fact, the Federal Commissioner points out that in comparison to the commercial fishery, aquaculture should be viewed as a good candidate to become a model of sustainable development, contributing to the long-term protection of aquatic ecosystems.

In 2002 the Aquaculture Association of Nova Scotia commissioned a report on the design of an Environmental Monitoring Program (EMP) for the marine aquaculture industry in Nova Scotia. The Nova Scotia Department of Agriculture and Fisheries is the lead agency for the delivery of the EMP and has recently completed the pre-design portion of that study. The focus of the monitoring is the qualitative and quantitative evaluation of sediments beneath suspended aquaculture sites. The program has been endorsed by senior marine scientists from the DFO and academic community and describes the sampling protocol and frequency for various aquaculture farms. This risk-based program is scaled to the species, size and production of each farm and includes specific environmental quality objectives for key measurements such as sulphide.

During the summer and fall of 2003 and 2004, the Department collected over 800 sediment cores from 40 stations on finfish sites, 105 stations on shellfish sites, and 126 stations at reference sites. Of these only three stations from two finfish sites have shown unacceptable readings. Both of these sites are currently being addressed through remediation plans.



During the course of sampling in 2003 and 2004 data were also collected from many formerly active aquaculture sites which have been either fallowed or vacant for anywhere from six months to three years. In these sites, sediment geochemistry has returned to the pre-development state. These findings will help build a model for guiding remediation efforts in the future. At the time of writing, results from the pre-design study are being collated and will be provided to the farms before being reviewed by a federal/provincial committee set up to review the annual EMP results. Both industry and the two levels of government are committed to transparency in the reporting of EMP results and once they are peer-reviewed and vetted through the regulators, these results will be made public.

The Nova Scotia Department of Environment and Labour's Green Plan, *Towards a Sustainable Environment*, identifies developing effluent guidelines and control technologies as part of an integrated approach to a sustainable environment for freshwater aquaculture. To this end, in January 2004, the Department of Environment and Labour has developed Water Quality Objectives and a model for the prediction of Phosphorus Concentration in Nova Scotia Lakes. These tools will be phased into the regulation of that component of the aquaculture industry in the future.

In 2002, the total area occupied by aquaculture farms in Canada was 30,971 hectares (OCAD 2003). From that relatively small area the Canadian aquaculture industry produced 176,969 tonnes of seafood valued at \$ 639 million. In Nova Scotia approximately 5100 hectares were occupied by aquaculture farms in 2003. By comparison, 234,035 hectares of land is used for agricultural purposes. Commercial fishing is conducted in all marine areas around the province encompassing hundreds of thousands of square kilometers of ocean space. From the small area occupied by Nova Scotia's aquaculture industry, it produced 451 tonnes of

seafood valued at \$40 million in 2003 and employed an estimated 1200 Nova Scotians on a full and part time basis.

An important fact to note is the high production value of finfish aquaculture which utilizes only a small area of coastline. In 2003 about 277 hectares of ocean space was licensed

for salmon and trout farming, an area less than one third the space occupied by the Halifax International Airport (960 hectares). When viewed in that context it is easy to see that significant economic growth can be realized from aquaculture production with only modest geographic expansion of the industry.

## 8.0 Animal Health and Food Safety

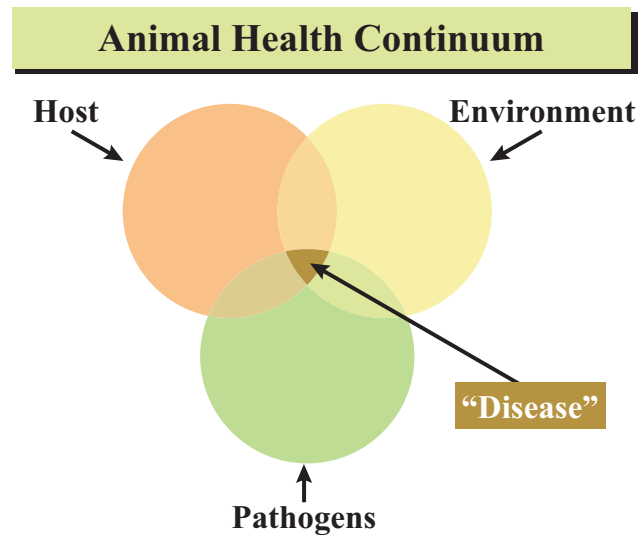
### 8.1 Aquatic Animal Health



Aquatic animal health is a cornerstone to sustainable and expanding fish farming opportunities. Because the aquatic industry is new to Canada, the public has little appreciation for the dynamics associated with the health of aquatic animals.

The health of farmed fish is intimately linked to three factors. The most important factor is the quality of the fish's environment. Significant factors affecting water quality include temperature, oxygen, adequate water flow, pollutant levels in the water, and problematic algae. The second important factor is the general overall health of the fish/host. Adequate nutrition and minimizing stressors such as handling, stocking densities, and controlling predators all contribute to keep fish healthy. Thirdly, the pathogen itself may be

powerful enough that contact will likely lead to ill health or mortality, or if somewhat benign, may only cause disease if the host immune system or the environment is compromised. Fish, like people and other animals, are continually exposed to disease causing organisms. It is only in the case where the host immune system is compromised or there is an imbalance in the environmental integrity or the pathogen type and level is serious enough that disease will occur.



Problems with health have existed since civilization and animal domestication began. Despite great advances in animal and human medicine significant health problems remain and must be dealt with. Challenges faced by aquatic farmers are similar to those faced in traditional agriculture and human medical fields. New emerging pathogens, epidemics,



chronic disease, requirements for vaccine and therapeutic development, routine and emergency veterinary care, efficient diagnostic tests and facilities, and public health concerns are all important issues facing fish farmers.

Advances in veterinary medicine have led to the development of fish vaccines that have significantly reduced the level of antibiotic use. High tech rapid diagnostic tools have been developed and specialists in aquatic animal medicine work in conjunction with farmers to prevent and minimize negative health impacts. Like other farming fields, private, government and research health specialists work together to sustain and develop food fish production and to address public health concerns.

A national animal disease control program in Canada is managed by the Canadian Food Inspection Agency under the *Health of Animals Act*. Unfortunately fish and shellfish do not qualify under the current management program. It will be important that an equivalent program be developed for aquatic animals so the industry can evolve and be sustainable in the event of a significant emerging disease outbreak. The Nova Scotian government is working with federal colleagues to design a program. It is envisioned that this program will address disease surveillance, reporting and control measures for pathogens considered of significant risk to the health of farmed and wild fish stocks and public health.

## 8.2 Food Safety

The protection of human health in relation to the consumption of aquaculture products is extremely well regulated in Canada. Because of the potential for serious illness or death as a result of eating contaminated shellfish from wild or farmed shellfish, the Canadian Shellfish Sanitation Program (CSSP) was developed in 1948 and has undergone many changes involving several Federal Departments and

agencies. Currently, responsibility for ensuring the safety of shellfish products rest with the Canadian Food Inspection Agency, the DFO, and Environment Canada. Provincial representation on the Regional Shellfish Growing Area Survey and Classification Committee ensures the concerns of Nova Scotia shellfish farmers are included in biotoxin monitoring programs, audits, closures and changes in policies or regulations affecting their business.

The current policy in Nova Scotia restricts shellfish aquaculture to areas classified as "open" under the CSSP classification system. One farm is licenced to harvest clams and quohogs in a closed area although all animals harvested from that lease are processed in a modern plant under CSSP regulations. The Department is currently re-assessing the policy with respect to locating leases in open areas. For example, there is little or no risk associated with leasing contaminated areas for producing seedstock only as these animals would be transferred to a clean area before growout to market, a process that typically takes several years. Protocols and procedures for the depuration of shellfish harvested from commercial fisheries in Nova Scotia have been successful and there is no reason to assume aquaculture products cannot be processed in an equally safe manner.

*"The health benefits of the protein and omega-3 fatty acids found in wild or farmed salmon from Canada...will almost definitely outweigh the risks for American adults where the leading cause of death is cardiovascular diseases."*

Dr. Eric Rimm, Associate Professor of Epidemiology and Nutrition, Harvard School of Public Health

A considerable amount of controversy has resulted from an article published in Science magazine in January 2003 concerning polychlorinated biphenyls (PCBs) in farmed salmon compared with wild salmon (Hites et al 2003). While this study cautioned against consuming farmed salmon compared to wild, the PCB levels reported were well below the safe consumption levels recognized by the World

Health Organization, the United States Food and Drug Administration and the Canadian Food Inspection Agency. The mean level of reported in the Hites et al study (0.06 ppm) were only three per cent of the FDA and CFIA limit of 2ppm. Levels of other organic contaminants and toxins such as lead were either well below the FDA/CFIA limits or undetected. (Santerre, 2004)

## **9.0 Engaging Partners**

An effective aquaculture development strategy needs strong partnerships and will require the support, endorsement, and active participation of industry, business, regional development authorities, community groups, and all levels of government.

### **9.1 Industry and Business**

Aquaculture brings economic benefits to Nova Scotia, but those benefits can be realized only if the industry can secure appropriate investment and pursue business opportunities. The benefits extend not only to rural and coastal areas, but to the whole province. The benefits it provides to rural and coastal communities are becoming increasingly important as more people and economic activity are concentrated in urban areas. These benefits provide opportunities for Nova Scotians, particularly young people, to remain and work in their communities. Aquaculture industry members and associations can play a key role in helping to educate Nova Scotians on the benefits of aquaculture. They can also encourage entrepreneurs to establish or invest in aquaculture operations.

### **9.2 Regional Development Authorities and Community Development Organizations**

Regional development authorities (RDAs) lead and coordinate economic development at the local level and represent a partnership between

federal, provincial and municipal governments. RDAs and community groups can play an important role in promoting the benefits of aquaculture for their communities. Government can share research with RDAs and community groups as well as provide an overall policy framework to ensure that partners are focused on the same outcome and strategic direction.

### **9.3 Federal and Municipal Governments**

Aquaculture is a shared responsibility of the federal and provincial levels of government. The success of any aquaculture strategy is dependant on co-operation between the two levels of government. Within each level of government several departments and agencies can influence aquaculture development. Operating effectively within this jurisdictional framework can present significant challenges to aquaculturists as they strive to remain competitive and grow high-quality products. The province works through the Canadian Council of Fisheries and Aquaculture Ministers (CCFAM) to identify and resolve harmonization issues. The province also works with several federal government departments and agencies through the aquaculture lease/license review process, including DFO, the Canadian Environmental Assessment Agency (CEAA), the Canadian Food Inspection Agency (CFIA), Environment Canada, and Public Works and

Government Services Canada. Other federal departments and agencies provide various types of financial assistance to the aquaculture industry.

Working with our federal partners should ensure that overlap and duplication of legislation and efforts are eliminated and that all partners are working together towards the same goals. This has not always been successful. The *Federal Environmental Assessment Act* passed in 1995 has proven to be onerous to industry and confusing to Federal and Provincial regulators across the country. While the intent of this legislation is certainly worthy, the federal government has struggled to balance regional concerns with the desire for national

consistency. In the implementation of the *CEA Act*. A lack of timely and practical implementation guidelines, committed and trained professional assessment staff, and the realignment of key agencies such as Navigable Waters Protection from the Canadian Coast Guard to Transport Canada has deterred aquaculture development and challenged existing partnerships.

Municipal governments are closest to people in communities. They can play an important role in engaging citizens about the benefits aquaculture can bring to their communities. They can also gauge support for aquaculture and identify strategic opportunities in their communities.

## 10.0 Policy, Regulation and Legislation



### 10.1 Nova Scotia Supports Aquaculture Development

Agriculture and Fisheries is committed to supporting the Government of Nova Scotia's corporate goals and strategic priorities that link to the mandate of agriculture and fisheries. In accordance with its mission and legislated mandate, the department 2004–05 Business Plan will strive to achieve the following five goals:

1. *Sustainable and environmentally responsible development of Nova Scotia's agriculture and fishing industries:*

Aquaculture is an environmentally sustainable method of food production. Good planning, sound industry practices and appropriate government regulation will ensure that the aquaculture industry will continue to grow food and generate economic activity for generations of Nova Scotians. Aquaculture requires relatively small geographic areas yet generates tremendous economic opportunity.

2. *A competitive business climate that encourages economic growth and job creation in Nova Scotia's rural and coastal communities:*

The Nova Scotia government supports aquaculture development based on its merits as a sustainable food production system and viable economic opportunity. Opportunities for Prosperity, Nova Scotia's economic growth strategy, identifies aquaculture as a vital economic sector with solid growth potential. Aquaculture is a sector that is positioned to benefit from the establishment of critical linkages and innovation infrastructure outlined

in the Nova Scotia Office of Economic Development's innovation policy framework, Innovative Nova Scotia, through expansion of the sector. Through strategic initiatives in R&D support, innovation infrastructure support, human resource development, commercialization support and direct government action, Nova Scotia will facilitate the establishing of linkages between the aquaculture sector, institutions and researchers to develop and adopt new products, processes and technologies.

3. *Orderly development of agriculture, aquaculture and fisheries through a regulatory regime which supports business and sector growth, and which ensures consumer confidence and food safety:*

Aquaculture is compatible with other coastal activities and is a legitimate user of our aquatic resources. It deserves equal opportunity for access as other stakeholders. Experience in Nova Scotia demonstrates that aquatic farms, can integrate well in communities throughout the province when local communities understand and support aquaculture. Aquaculture provides safe and healthy food. Public awareness of the nutritional and safety aspects of food is very high. Ongoing research continues to highlight the health and nutritional benefits of eating seafood, particularly those high in Omega 3 fatty acids. Combined with the food security and traceability offered by farm raised seafood, aquaculture is in a unique position to meet the demands of modern consumers.

4. *Globally competitive NS workforce through education, training, research and community services:*

Aquaculture is a rural industry that provides jobs and economic activity in coastal communities. The 2003–04 Skills Nova Scotia Action Plan for preparing Nova Scotia's workforce to succeed in the labour market and contribute to a growing economy has among its

goals and objectives: providing better labour market access and support to Nova Scotians, and increasing the capacity of post-secondary education and training systems to respond to emerging labour market needs. This includes the scientific, vocational and business management skills required to succeed in the aquaculture sector.

5. *Public services that are accountable and serve to meet identified industry needs.*

Regulatory control of aquaculture needs to be more accountable and more responsive to changes in the industry. Performance standards for reviewing applications need to be developed and adhered to in order to provide investors and proponents with the confidence that their hard work will be reviewed in an objective and timely fashion. Aquaculture can diversify our seafood production. The importance of seafood production and export to the province cannot be overstated. Aquaculture produces high value seafood products that are in high demand in the marketplace. It is important that we are able to adapt to new methods of seafood production and changing trends in the marketplace. Aquatic farming complements our seafood production and is not a threat to local traditional fisheries when appropriately situated.

## 10.2 Nova Scotia has a Rigorous Site Planning/Approval Process



To establish a commercial aquatic farm in Nova Scotia a licence (and lease if ocean-based) from the Nova Scotia Department of Agriculture and Fisheries is required. To apply for an aquaculture licence/lease proponents must pay a fee, and submit an application along with a detailed farm development plan. The development plan describes all aspects of the proposed farm including, business, technical, environmental and site location information.

Once an application is accepted, it undergoes a comprehensive review involving up to 12 provincial and federal agencies (see appendix B). All aspects of the proposal are reviewed, including, the knowledge and experience of the proponent, the proposed farm technology and site layout, environmental impacts, interactions with landowners, fishermen, and other stakeholders, and the business and marketing plan. All applications, (except those for shellfish grown directly on the sea bottom) must undergo an environmental assessment under the *Canadian Environmental Assessment Act*.

While the current review process for aquaculture is rigorous and thorough, it is also time consuming and costly. Reviews can take 12-36 months and cost proponents tens of thousands of dollars, with no certainty of success. This applies to new applications and expansions. Industry supports environmental assessments as a planning tool. However, the high cost and lengthy review period is deterring aquaculture investment in the province and all but excluding smaller proponents. Changes must be made to the licensing system to reduce the time and cost associated with licence/lease applications and provide a stable positive business climate for aquaculture. To this end, a Federal/Provincial task group has been struck to harmonize the information requirements of the various regulatory agencies to develop a single comprehensive application document which would reduce the cost and time require for new applications. Both industry and regulators will benefit from this initiative which must be considered a priority for development.

### 10.3 Broodstock and Seedstock



Both finfish and shellfish aquaculture depend on a source of seedstock to begin the production cycle. Some shellfish farms may be vertically integrated and are capable of collecting and supplying some or all of their own seed supply. Mussels and oysters are examples of species whereby farmers may produce their own seed. More often, the environment leased to maximize grow-out potential is not always suitable for seed production. Often, shellfish farmers must purchase seed from outside sources which include other provinces. Most marine salmon and trout farms purchase smolt from freshwater hatcheries in areas non-adjacent to the grow out lease, although these hatcheries may be owned by the same parent company in Nova Scotia or New Brunswick. Hatcheries in turn purchase eggs from outside suppliers unless they have access to their own broodstock.

The movement of all seedstock, broodstock and mature fish and shellfish in Nova Scotia is regulated by the National Code on Introductions and Transfers of Aquatic Organisms (Anon, 2003). This code was developed cooperatively by the Provincial, Territorial and Federal Governments and is intended to protect aquatic ecosystems from the effects of unwise intentional introductions or transfers of fish or shellfish, while at the same time allowing responsible use of aquatic resources for aquaculture and other purposes.

The National Code sets in place a committee structure (the Introductions and Transfers Committee) and risk analysis procedure for assessing the potential biological impacts of introductions and transfers. Potential adverse effects may include harmful alterations to natural ecosystems, deleterious genetic changes in indigenous fish or shellfish populations, and the risk to wild or farmed animal health from the introduction of pathogens or parasites that may accompany the aquatic organisms being moved. The health of fish and shellfish transfers prior to movement is assessed under various regulations and guidelines including the Fish Health Protection Regulations under the *Fisheries Act* for the movement of salmonids, the Maritime Fish Health Guidelines for transfers within the Maritimes, and certain shellfish diseases are screened for before a transfer permit is issued.

Although fish and shellfish farmers are aware of these regulations, the time required for a risk assessment of non-routine transfers is sometimes too long for effective business planning. Changing geographic status of new and significant diseases such as ISA and MSX, as

well as the uncertainty associated with new diagnostic techniques has burdened the aquaculture industry and hampered development. In some cases, farms have gone out of business, not from the direct effects of disease, but as a result of restrictions placed on the movement of seedstock. Decisions based strictly on science advice have not always taken into consideration the socioeconomic impact of restricting the use of certain genetic strains or the transfer of seedstock.

Other issues with seedstock supply have been problematic for the industry. In past years poor coordination between hatchery production and available grow out sites has resulted in an oversupply or undersupply of seedstock drastically affecting prices. A lack of pure strain *Mytilus edulis* mussel seed is currently a concern for mussel farmers. The Department and the industry associations have been pro-active in extension efforts to train mussel and oyster farmers how to identify and collect their own seed in order to become less dependent on outside seed sources which may be unreliable as a result of a change in disease status.

## 11.0 Communication in Support of Aquaculture

A successful aquaculture strategy must communicate both the benefits of the industry, the employment it provides, and its products. This includes explaining research findings and dispelling myths about the industry. A major factor in the decline in public support for aquaculture is the intense negative scrutiny the industry has been subjected to in recent years. While many reports and claims about aquaculture are false or exaggerated, they appear to have taken their toll on public support. In Nova Scotia, the problem is compounded by the low profile of the industry and lack of economic clout. Communities that are home to successful aquatic farms are well aware of the jobs and economic spin-offs of aquaculture, however, most Nova Scotians are unaware of the positive contribution that aquatic farming can provide to the province.

The aquaculture industry, through the Canadian Aquaculture Industry Alliance (CAIA), has been actively promoting the benefits of aquaculture while dispelling many

of the myths that persist in the public opinion. They have coordinated initiatives on food safety and traceability, national Codes of Practice and Standard Operating Procedures. While information on these initiatives is available on their website, a search for aquaculture on the internet typically produces proportionally more articles condemning aquaculture. The volume of scientifically defensible, fact based information supportive of aquaculture must be increased to counteract its' detractors. The industry must be responsible for promoting and defending itself.

The provincial and federal governments must also play a role in the dissemination of information supporting aquaculture. Unbiased and transparent reporting of peer-reviewed results from environmental monitoring programs, environmental assessments, and annual performance reviews will serve to allay the public concerns that the industry is not regulated sufficiently.

## 12.0 Constraints to Aquaculture Development in Nova Scotia

A number of constraints must be overcome for aquaculture to reach its potential in Nova Scotia. Action is needed in some areas immediately to improve the aquaculture development climate in the province and “kick start” industry growth.

Declining Public Support. Public confidence and support for aquaculture appears to be eroding at the global, national and local level. In addition to the intense negative scrutiny the industry has been subjected to in recent years, changing demographics are also a factor affecting support for aquaculture in coastal communities. Many coastal residents no longer earn a living in the community where they live. Retirees, seasonal residents and persons commuting to cities and towns for work are a growing percentage of coastal residents. To some degree, the demand and/or perception of the need for local economic activity is diminishing in some coastal communities. A communications program is required to dispel myths about aquatic farming, explain the economic and social benefits it offers and demonstrate the Nova Scotia government support for the industry.



### Regulatory Climate and Property Rights (Lease Tenure)

The industry is regulated by both the federal and provincial governments. Much of the legislation governing aquatic farming was developed long ago for other purposes. There is no specific federal aquaculture legislation. The industry is governed by a patchwork of legislation including the *Fisheries Act*, *Canadian Environmental Assessment Act*, *Navigable Waters Protection Act*, *Environment Act*, *Species at Risk Act* etc. In Nova Scotia, the primary legislation is the *Fisheries and Coastal Resource Act* which has specific aquaculture provisions. Provisions of other legislation such as the *Environment Act*, and *Wildlife Act* also apply to aquatic farming.

A consequence of the overlapping and sometimes inappropriate legislation, is a regulatory regime that is complex, confusing and non-transparent. This problem is compounded by an overall lack of objective standards and criteria to review aquaculture applications. From industry’s perspective, the regulatory regime in Nova Scotia is complex, arbitrary and expensive. To concerned stakeholders, the patchwork nature of regulation appears to lack rigor. They often express a lack of confidence in government’s ability to regulate the industry. This often results in controversy surrounding ministerial decisions to grant aquaculture licences and leases in the province. The end result of this situation is that aquaculture proponents are being deterred and development is stalled.

Several actions are required to improve the regulatory regime in Nova Scotia. Whenever possible objective criteria and standards should be developed and employed to guide decision making and monitoring compliance. This will create a more predictable and transparent operating climate in the province that will



provide farmers with the confidence they need to invest and Nova Scotians the assurance they need that the industry is appropriately regulated. Areas of overlapping regulation between federal and provincial jurisdiction need to be resolved. This will provide clarity, reduce expense to government and industry and it will eliminate regulatory conflicts. In fact, Fisheries and Oceans Canada (DFO) has indicated in its *Aquaculture Policy Framework (APF)*, that it will work with provincial governments to harmonize the site-application process, including information and reporting requirements, to reduce inefficiencies and costs to all parties involved. In the October 2004 Speech from the Throne, the federal government announced that it will consolidate its environmental assessments and work with the provinces toward a more unified and effective environmental assessment process. Specific changes are required to the provincial *Fisheries and Coastal Resource Act* to enhance the property rights and lease tenure provisions to ensure that aquatic farmers and financial institutions have the confidence they need to invest in Nova Scotia.

Strategic direction and development support.

The nature of aquaculture development in the province has been diverse both in terms of geography and species under cultivation. Strategic approaches have generally not been used to assess opportunities and establish priorities. Nor has there been an appropriate

development program to provide the necessary support and funding. The result has been a diffuse “shotgun” approach to development. Other jurisdictions that have employed a focused approach and provided the necessary development support have achieved much higher levels of success than Nova Scotia.

A strategic plan for aquaculture development in Nova Scotia is required. Such a plan would identify the best development opportunities and provide a focus for government efforts and resources. An appropriately funded development program should also be established to support the objectives of the strategic plan.

There is interest from both the federal and Nova Scotia governments in supporting the development of the aquaculture sector. The federal Commissioner for Aquaculture indicated that a framework to provide emphasis on R&D priorities in support of continuous improvement in productivity and environmental sustainability within the aquaculture sector is vital. In addition, DFO’s Aquaculture Policy Framework, Innovative Nova Scotia, and Opportunities for Prosperity all make commitments to facilitate partnerships for innovation and commercialization, including in the aquaculture sector. These commitments must be supported in earnest by management in the region and by providing the requisite funding and human resources.

## 13.0 Aquaculture Vision and Development Strategy

### 13.1 Aquaculture Vision

The Nova Scotia Department of Agriculture and Fisheries foresees a time in Nova Scotia when:

*Aquaculture is recognized as an economically sustainable and environmentally responsible industry that provides high quality seafood products for domestic and export markets. Coastal communities welcome and respect aquaculture farms as an integral part of traditional activities that create employment and provide opportunities for social and economic growth. The government of Nova Scotia is recognized as providing a positive stable climate for industry growth while at the same time fulfilling our obligation to protect the environment for future generations.*

With a good development climate and sound support strategies, the aquaculture industry in Nova Scotia can realize its growth potential and provide significant economic and social benefits to the province.

### 13.2 Aquaculture Development Strategy

To achieve the vision for aquaculture in Nova Scotia, the government must:

- Offer clear and tangible support for aquaculture development;
- Adopt a focused strategic approach to guide its efforts and resources;
- Establish a positive business climate and improve the regulatory framework for aquaculture
- Establish a transparent and effective environmental monitoring program;
- Implement a comprehensive communications plan to build support for aquaculture;
- Ensure maximum utilization of leased areas and compliance with leasing and licencing conditions.

A strategic plan for aquaculture development in Nova Scotia must identify the best development opportunities and provide a focus for government efforts and resources. An appropriately funded development program should also be established to support the objectives of the strategic plan.

To be effective, an aquaculture development strategy must go beyond a development program. It must improve the regulatory regime in Nova Scotia. Whenever possible objective criteria and standards should be developed and employed to guide decision-making and monitoring compliance. This will create a more predictable and transparent operating climate in the province that will provide farmers with the confidence they need to invest and Nova Scotians the assurance they need that the industry is appropriately regulated. The province must work with the federal government to establish service standards for processing aquaculture applications that will guarantee applications will be processed in a timely manner. This should include a tracking system applicants can access to monitor the status of their application. Areas of overlapping regulation between federal and provincial jurisdiction need to be resolved. This will provide clarity, reduce expense to government and industry and it will eliminate regulatory conflicts.



This document is intended to provide a background to the aquaculture industry and identify the major issues related to aquaculture development. To the fullest extent possible, efforts have been made to solicit comments from key participants in its preparation. Any omissions or errors will be identified and corrected in the ensuing consultations. As indicated in the preface, a comprehensive

consultation plan will follow its publication in February 2005. The Department of Agriculture and Fisheries will work diligently to produce a focused Aquaculture Development Strategy based on the feedback received on this discussion document during the consultation period. The Aquaculture Development Strategy will be released in 2005.

## **Appendix A**

### **Aquatic Farming In Canada and Nova Scotia**

Over the past 20 years, aquatic farming in Canada has grown significantly. In 2002, the aquaculture industry produced 176,696 tonnes of seafood valued at \$ 639 million, which accounted for 23% of the value of total fish landings. The percentage of seafood produced by aquatic farms compared to the capture fishery has been steadily increasing.

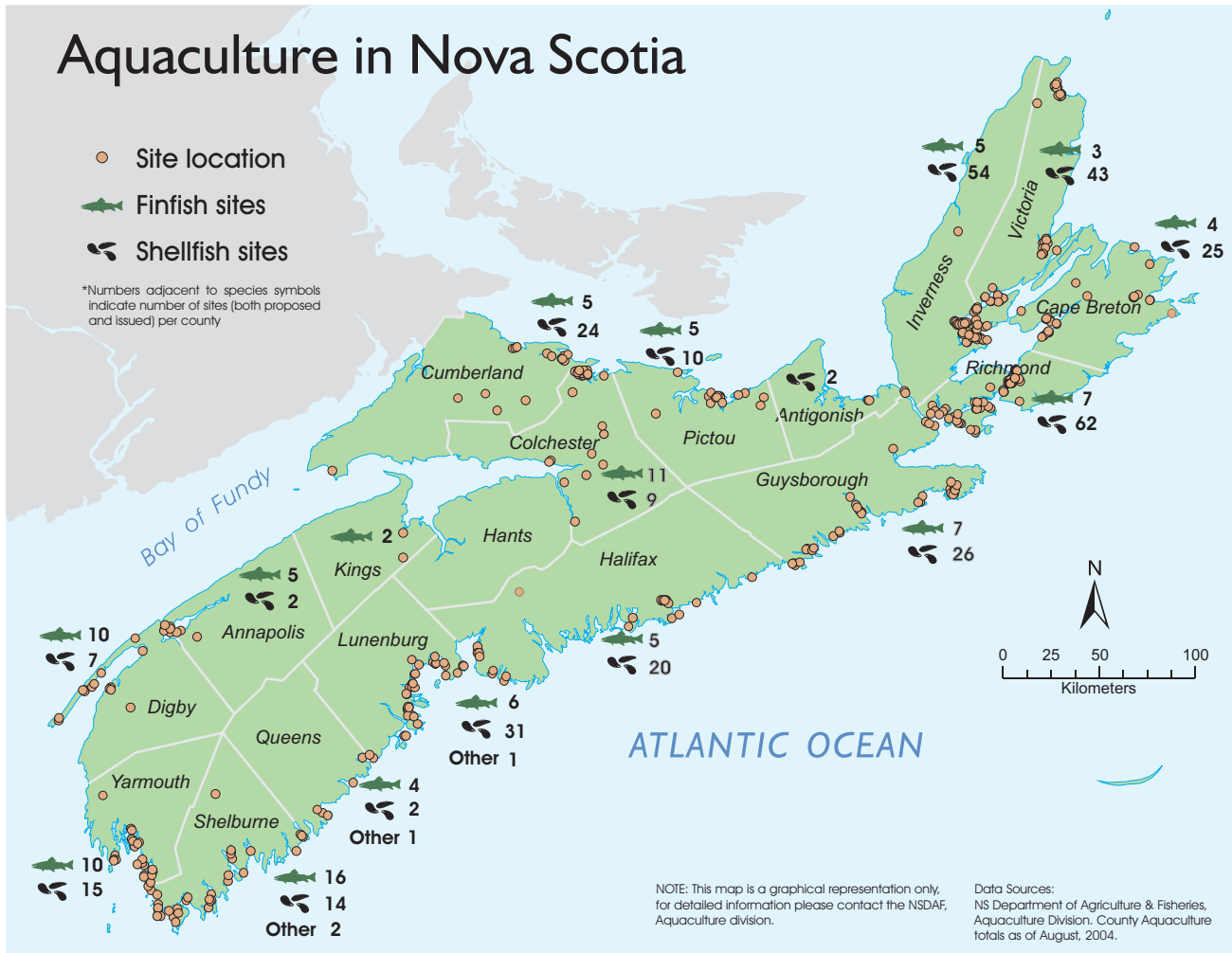
Over 70 aquatic species are licenced for aquatic farming in Canada and farms are located in all provinces and one territory. Commercial production is dominated by Atlantic salmon, blue mussels, oysters, trout and steelhead. In 2001 and estimated 12,390 Canadians were employed in the aquaculture industry, two thirds of which were under age 35 (DFO 2003).

British Columbia and New Brunswick are the leading aquaculture provinces in Canada. Together they account for over 80% of total Canadian production by value. Both provinces have suitable marine areas, which allow for a concentration of high value Atlantic Salmon. In 2002, Atlantic salmon accounted for over 95% of the total aquaculture production in each province.

Prince Edward Island is the national leader in blue mussel production accounting for approximately 80% of all Canadian mussel production. Similar to British Columbia and New Brunswick, Prince Edward Island production is heavily concentrated on one species, blue mussels. It comprises over 80% of the Island's farmed seafood value.

Newfoundland has a mix of finfish and shellfish aquaculture. Like Nova Scotia it has limited areas suitable for Atlantic salmon. Newfoundland grows the most steelhead trout in Canada and recently surpassed Nova Scotia as the second largest supplier of blue mussels. Aquatic farming in Nova Scotia is best defined as diverse. Thirty-five different aquatic species are licenced for farming purposes in the province. Aquatic farms operate in all parts of the province, occupying a range of natural aquatic habitats and land-based facilities. The primary commercial species under cultivation include Atlantic salmon, steelhead trout, mussels, oysters, quahogs, marine plants and halibut. Although a large number of species are grown, Atlantic salmon dominates commercial production values.

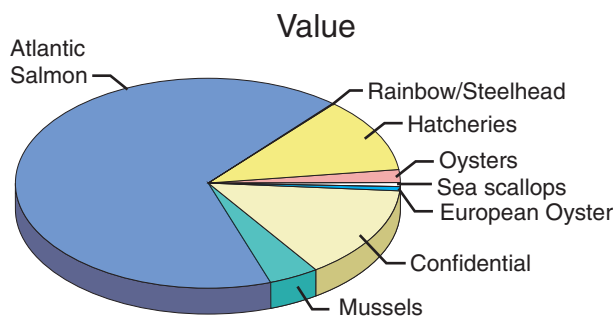
# Aquaculture in Nova Scotia



Nova Scotia has a tradition of pioneering aquatic farming methods. From Canada's first land-based salmon farm in the 1960's, to the development of mussel, trout and oyster techniques in the 1970's and 1980's, Nova Scotia has been on the forefront of developing aquatic farming. Today, the province is home to well established commercial farms that are growing, and selling Atlantic salmon, steelhead, mussels and oysters throughout Nova Scotia, Canada, U.S.A. and Europe. Nova Scotia is also home to companies that are global leaders in sea plants and halibut farming.

ventures were strong in one aspect, but weak in the other. Business support for aquatic farming in Nova Scotia has not been as strong or focused as it is in some other provinces. The aquatic farmers in the industry today have survived many difficult challenges and represent a core group that is poised to drive future growth.

### 2003 NS Aquaculture Production

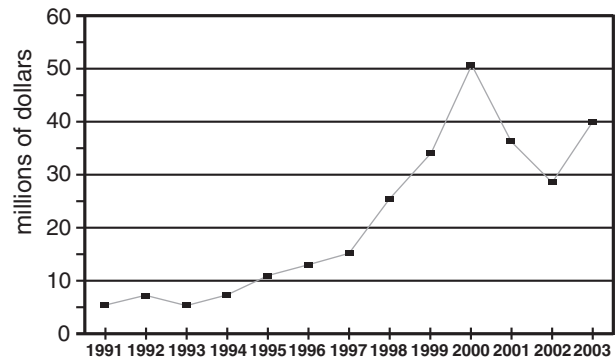


Source: NSDAF

Growth in Nova Scotia's aquatic farming industry has been positive with periods of rapid growth during the late 1990's. Overall growth has been positive, however, there have been many setbacks along the way. The aquatic farming industry in Nova Scotia has experienced more than its fair share of business failures over the years. The industry today would be much larger and leading production of one or two species had more start-up farms succeeded over the past 20 years. There are many reasons for the high failure rate. The most obvious is the challenging regulatory and development climate that exists in the province. Inadequate screening of proponents and a desire to fast-track heavily subsidized proposals has also contributed to large scale failures on several occasions. The combination of both excellent business skills along with technical and husbandry skills is essential for a successful aquaculture venture; many early

### NS Aquatic Farm Production

Value of all species



Source: NSDAF

### Seafood Consumption Trends

A tangible sign of the "blue revolution" is the increased presence and consumption of aquaculture seafood in the marketplace. Aquaculture products account for a significant amount of the seafood consumed in Canada and the United States. Farm raised seafood has become a staple item at seafood counters and is the primary source of supply for several popular species. Seafood consumption trends are similar in the U.S. and Canada, although per capita consumption in Canada is higher. In 1999, the last year for which data is available, Canadians consumed 9.9 kg of seafood per person. In the U.S., seafood consumption has been relatively stable at approximately 6.8 kg per person for the last 10 years (Johnson 2002).

Although consumption has remained stable, the amount of farm raised seafood that is consumed in the U.S. has increased significantly. On a per capita basis, farm raised

species now account for about 30 percent of total seafood consumption. Most of the increase is from higher imports of farm raised fish (Harvey 2003). In 2001, four of the top ten seafood items consumed in the U.S. were supplied primarily by aquaculture sources (OCAD 2003).

<b>Top Aquaculture Species Consumed</b>	
Source: Johnson 2002	
<b>United States</b>	<b>Canada</b>
Shrimp	Shrimp
Salmon	Salmon
Catfish	Trout
Tilapia	Oysters
Trout	Mussels
Oysters	
Mussels	

### **Environmental Sustainability**

From an environmental perspective, aquatic farming is not a unique industry. Its environmental interactions are similar to other industries and human activities. Generally the environmental risks of aquatic farming have been well studied and are well understood. Most of the risk can be mitigated through proper site planning, good husbandry and management practices.

Aquatic animals have characteristics that make them very efficient and well suited for food production. For example, both shellfish and finfish obtain the water they need from their environment. The demand traditional land-based agriculture places on fresh water resources continues to be a challenge, particularly in recent years where dry summers have posed real problems for livestock farmers. This is an increasingly important issue as demands for global freshwater supplies

continue to increase. Another common feature is that both fish and shellfish are cold blooded. Their body temperature is the same environment around them, which means they do not use feed to maintain body temperature as other food animals must do (e.g. pigs, chickens and cows), and more food energy can be put into building body mass.

The commercial shellfish species grown in Nova Scotia, mussels, clams, and oysters are filter feeders. These animals utilize the natural productivity of the water around them to grow. No additional feed is required. From an ecological perspective this is a very efficient and low impact means of animal food production. In fact, shellfish farming has been shown to provide environmental benefits in the form of excess nutrient removal (Costa-Pierce 2002).

The primary consideration for shellfish farming is to ensure that the density of shellfish in a bay do not exceed its natural carrying capacity. Large scale farms can have localized effects on current regimes and sedimentation under farms. However, with proper site selection and planning this can be minimized or avoided. Shellfish farming in Nova Scotia is typically low density and there is no evidence of any farm exceeding the carrying capacity of the surrounding bay. Most opposition to shellfish farms is based on conflicts with other users and perceptions of risk, rather than actual environmental harm.

The farming of fish does require feed, however salmon and trout have the advantage of being very efficient at converting feed into energy and muscle, which allows the use of highly concentrated feeds. Combined with modern farming techniques and feed formulations, these factors allow salmon and trout farms to achieve very efficient feed conversion ratios (FCRs).

Efficiently run salmon farms have FCRs approaching 1 (1 kilogram of food produces 1 kilogram of whole fish). This compares favorably with other forms of animal production.

<b>Production Efficiencies (FCR)</b> (kg dry food/kg wet weight gain)	
Farmed Atlantic Salmon <sup>1</sup>	1.5
Broiler Chicken <sup>2</sup>	2.0
Pork <sup>2</sup>	2.5
Rabbits <sup>2</sup>	3.0
Lamb <sup>2</sup>	4.0
Beef <sup>2</sup>	5.9

<sup>1</sup> Marine Harvest

<http://www.marineharvest.com/mh/MHWeb.nsf/0/254A1CC5D8E8A2FBC1256CDB00302D0C?OpenDocument>

<sup>2</sup> Costa-Pierce 2002.

In recent years there has been much debate about the use of fish meal and oil to produce the feed that is required to grow fish species such as salmon and trout. Some reports have alleged that fish farms put pressure on wild stocks of the species harvested to provide the fish meal and oil. The reality is that the species harvested for fish meal are not used for human consumption and the fisheries providing them have been sustainable for the past 20 years. Moreover, fish farming is just one of several sectors that utilize fish meal and oil. They are also used as feed ingredients for farm raised animals such as chickens, pigs other fish and pet food.

<b>Estimated Portion of Fishmeal Use in 2000<sup>1</sup></b>	
Poultry and Pigs	53%
Aquaculture	35%
Other	12%

<sup>1</sup> Modified from Delgado et. al. 2003

Most years, poultry production is the single largest user of fish meal. However, demand from aquaculture has increased significantly. Ultimately, competition among users (terrestrial vs. aquatic farms) of fish meal and oil will determine how the world's supply is used. Important factors will include price and the ability to substitute with non fish meal sources of protein. Presently, aquatic feed companies are researching new diet formulations utilizing alternate forms of protein that are nutritionally sound and cost effective.



### Benefits of Aquaculture Products

Aquaculture products are popular with consumers, retailers and the food service sector because they are healthy, affordable, safe and offer consistent quality and year round availability. More and more consumers are concerned about what they eat and seafood is widely recognized as a healthy choice. Seafood offers many of the nutrients for a healthy lifestyle and is inherently low in fat, especially saturated fat. Saturated fat is regarded as the main culprit in cardio-vascular disease. In contrast, seafood is the primary source of Omega 3 fatty acids which helps prevent strokes and heart attacks. On going research continues to highlight the health benefits of regular fish consumption.

Another common feature of farm raised seafood is affordability. Products that were once considered luxury foods and priced accordingly become widely available and more affordable, when adapted to the agri-food model of production. For example, farm raised salmon, which is widely available and very affordable, now competes with poultry, beef and pork products as a staple source of protein.

Flexibility is another unique feature of farm raised seafood. It can be grown and harvested to meet specific market criteria such as size, colour, weight. Equally important is the fact that farmed seafood is available year- round, free of restrictions imposed by regulated seasons, weather or natural stock variability. This consistent supply is very convenient for consumers, retailers, chefs and the food service sector.

Food safety and traceability are also important attributes of farm raised seafood is. Like other seafood products farm raised seafood must meet strict processing, packaging, labeling and quality requirements. Because farm raised products are under human control at all times during production it is easy to verify and monitor quality and safety aspects. It is also easy to implement traceability measures if required due to a recall or other events. Traceability has become an important feature in recent years with the heightened awareness of the potential for bio-terrorism involving food.

### Species Farmed In Nova Scotia

Several of the most popular farm raised seafood products in the United States and Canada are grown in Nova Scotia. From a national perspective Nova Scotia ranks second or third in the production of several key species.

#### Atlantic Salmon

Demand for Atlantic salmon has grown considerably in the U.S. market. Over the past

five years salmon consumption increased by 57% (Johnson 2002). This growth is attributed to increases in farmed supplies and lower prices, which allow salmon to compete directly with higher value pork and beef products ( Harvey 2003). Canada and Chile are the primary suppliers of farmed salmon to the United States. In 2001, Canadian salmon farmers supplied 42% of the salmon imported, just behind Chile at 49% (Johnson 2002). Most of the salmon grown in Canadian comes from farms in British Columbia and New Brunswick. Nova Scotia farms rank third in Canada for total salmon production.

Canadian Salmon Production 2002  
Source: Statistics Canada

	tonnes	\$ million
B.C.	89000.00	308.60
N.B.	38900.00	194.50
N.S.	1951.00	12.50
N.F.L.D.	1270.00	6.10
Totals	131121.0	521.70

A critical limiting factor for salmon farming in Nova Scotia is marginal water temperatures and ice during the winter. Future growth in Nova Scotia salmon production will depend on finding suitable sites, and utilizing existing sites to their fullest potential.

#### Mussels



Another popular farm raised seafood is mussels. Farmed supplies dominate mussel supply and consumption in the U.S. and Canada. Year round availability, high meat yields and grit free meats make them a very popular shellfish.



Recent reports suggest that supplies may not keep pace with growing demand and markets (Seafood Business 2003). U.S. mussel imports increased from three million kilograms in 1992 to 21 million kilograms in 2002. Demand for mussels is driven by increased consumption in the at-home market and by restaurants seeking low cost seafood items for their menus (Harvey 2003). Atlantic Canada is the primary supplier of live farm raised mussels to the U.S. market. Prince Edward Island produces about 80% of mussels grown in Canada. Future growth will likely come from other Atlantic provinces as reports indicate that P.E.I. has utilized all good growing areas and production has peaked. Nova Scotia has excellent potential to expand mussel production.

### Steelhead Trout

#### **Canadian Mussel Production 2002**

Source: Statistics Canada

	tonnes	\$ million
P.E.I.	16785.00	22.20
N.F.L.D	1700.00	5.50
N.S	1073.00	2.20
N.B	637.00	0.80
Que.	345.00	0.60
Totals	20540.00	31.30

Global trout production is dominated by farm raised fish. In 2001, over 90% of trout production was farmed. Several species such as rainbow, brown and brook trout are raised commercially. Most of the trout grown in Canada are raised in freshwater. Ontario is the largest producer. In Nova Scotia, most trout production is based on growing rainbow trout in the ocean. These fish are referred to as steelhead trout. Nova Scotia and Newfoundland are the only provinces growing steelhead.

In some markets, fresh trout is becoming popular as a salmon substitute, however, trout is also creating its own product identity given its flavour, texture and colour which is distinct from salmon. Japan, Europe and the Far East are

#### **2002 Canadian Trout Production**

Source: Statistics Canada

	tonnes
Ontario	4650.00
N.F.L.D. (steelhead)	1600.00
Sask.	914.00
Que.	850.00
N.B.	550.00
N.S.(steelhead)	434.00
B.C.	100.00
Man.	16.00
Totals	9114.00

major world markets. Most of the steelhead produced in Nova Scotia is sold in North America. Interest in trout has been growing in North America and U.S. imports have been increasing (Seafood International 2003).

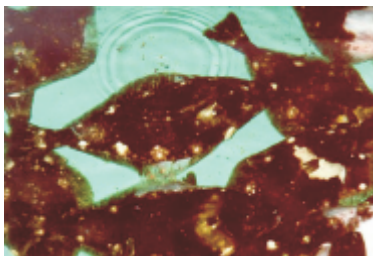


Steelhead production offers a unique opportunity for Nova Scotia as the fish can be raised to acceptable market size in one growing season without the need to overwinter. This avoids problems with marginal water temperatures and ice and increases the development potential for this species in the province. Nova Scotia growers have demonstrated that the bio-physical conditions in Nova Scotia will support steelhead aquaculture. Farmed production rose from 590 tonnes in 1997, to 4681 tonnes in 2000.

There is opportunity to expand steelhead production, however, there are marketing issues caused by seasonal production that need to be

addressed. To avoid selling at low prices when the market is flooded, Nova Scotia farmers need to implement measures to extend their marketing period, beyond the narrow harvesting period in the fall.

#### Atlantic Halibut



Atlantic halibut is one of the most valuable whitefish species. Its high value and inconsistent supply from wild sources makes it a prime candidate for aquaculture production. Several countries, including Canada, are involved in the research and development to fully commercialize halibut culture. Norway, Iceland and Scotland are heavily involved in halibut farming.

Nova Scotia is on the forefront of Canadian efforts to cultivate halibut. Two companies, Scotian Halibut and R&R Halibut have been involved in the successful development of techniques for juvenile production and commercial grow-out. Unfortunately, an accident led to the loss of all broodstock and juveniles at R&R Halibut in 2004. The stocks at Scotian Halibut remain strong and Nova Scotia has the potential to be a national leader in the production of farm raised halibut given proper support.

Commercial production of halibut can be broken in two components, farms which produce juveniles and those that grow fish to market size. In recent years, juvenile production has become more reliable and focus has shifted to determining the best bio-economic models for commercial production. It is a critical time for halibut farming in Nova Scotia. Industry is requesting that government establish a financial assistance program to aid the transition from developmental to commercial

production. The industry has suffered from the recent downturn in the Atlantic salmon industry as investors seek to minimize risk in light of an unfavourable currency exchange for U.S. exports and competition from abroad.

#### American Oyster



Nova Scotia is a traditional supplier of American oysters to the market. Commercial fisheries and farming operations are established in the Bras d'Or Lakes, along the north shore and recently in Eel Lake, Yarmouth County. Production increased dramatically in recent years but has declined due to the introduction of a foreign disease in the Bras d'Or Lakes that is blamed for destroying much of the commercial stocks on farms and commercial fishing beds. Some areas are unaffected and continue to supply oysters. Efforts are underway to rebuild the stocks and re-establish farms that were affected by the disease. Given the large amount of suitable habitat for American oysters in the province there is significant potential to expand production in the future.

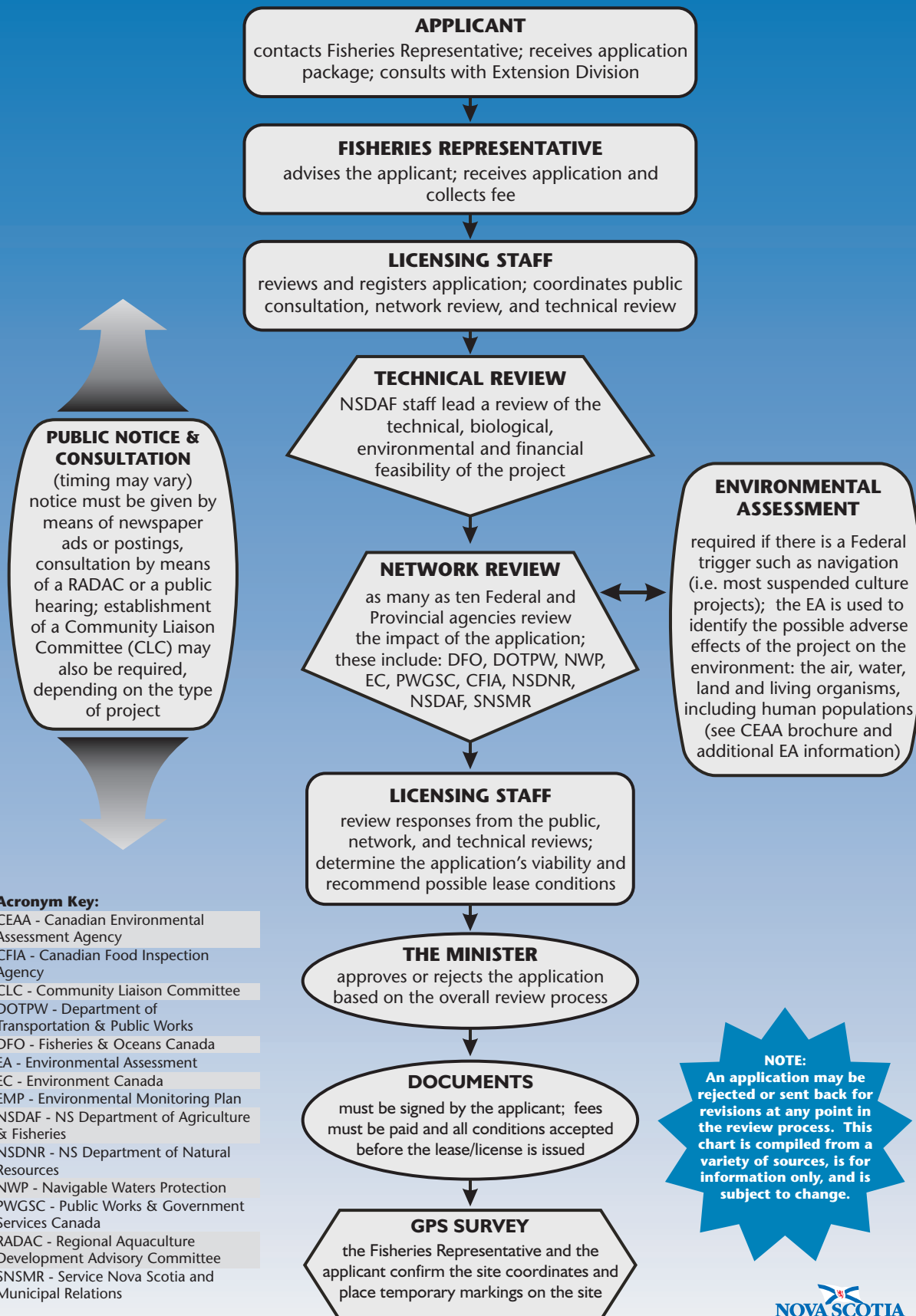
#### Marine Plants

Nova Scotia is home to Acadia Seaplants which is the largest independent manufacturer of seaweed specialty products in the world. Acadian Seaplants is a technology based company that produces a range of products including, specialty fertilizers, feed, food, food ingredients and brewery supplies utilizing certain species of marine plants. In addition to harvests of naturally grown marine plants, Acadian Seaplants is a recognized leader in the field of marine plant cultivation.

## Appendix B

# AQUACULTURE LEASE/LICENSE REVIEW PROCESS

Nova Scotia Department of Agriculture and Fisheries



### Acronym Key:

CEAA - Canadian Environmental Assessment Agency  
 CFIA - Canadian Food Inspection Agency  
 CLC - Community Liaison Committee  
 DOTPW - Department of Transportation & Public Works  
 DFO - Fisheries & Oceans Canada  
 EA - Environmental Assessment  
 EC - Environment Canada  
 EMP - Environmental Monitoring Plan  
 NSDAF - NS Department of Agriculture & Fisheries  
 NSDNR - NS Department of Natural Resources  
 NWP - Navigable Waters Protection  
 PWGSC - Public Works & Government Services Canada  
 RADAC - Regional Aquaculture Development Advisory Committee  
 SNSMR - Service Nova Scotia and Municipal Relations

January 2005

**NOVA SCOTIA**  
Agriculture and Fisheries

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