Recommendations for Change

"Aquaculture, not the Internet, represents the most promising investment opportunity of the 21st Century"

Peter Drucker,
Economist and Nobel Laureate

Report of the Commissioner for Aquaculture Development to the Minister of Fisheries and Oceans Canada

2004

Fisheries and Oceans Canada
Pêches et Océans Canada
Canada

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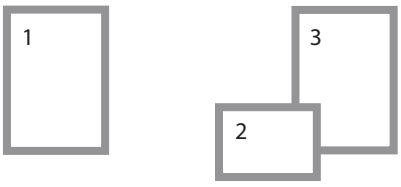

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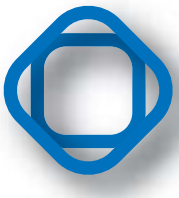

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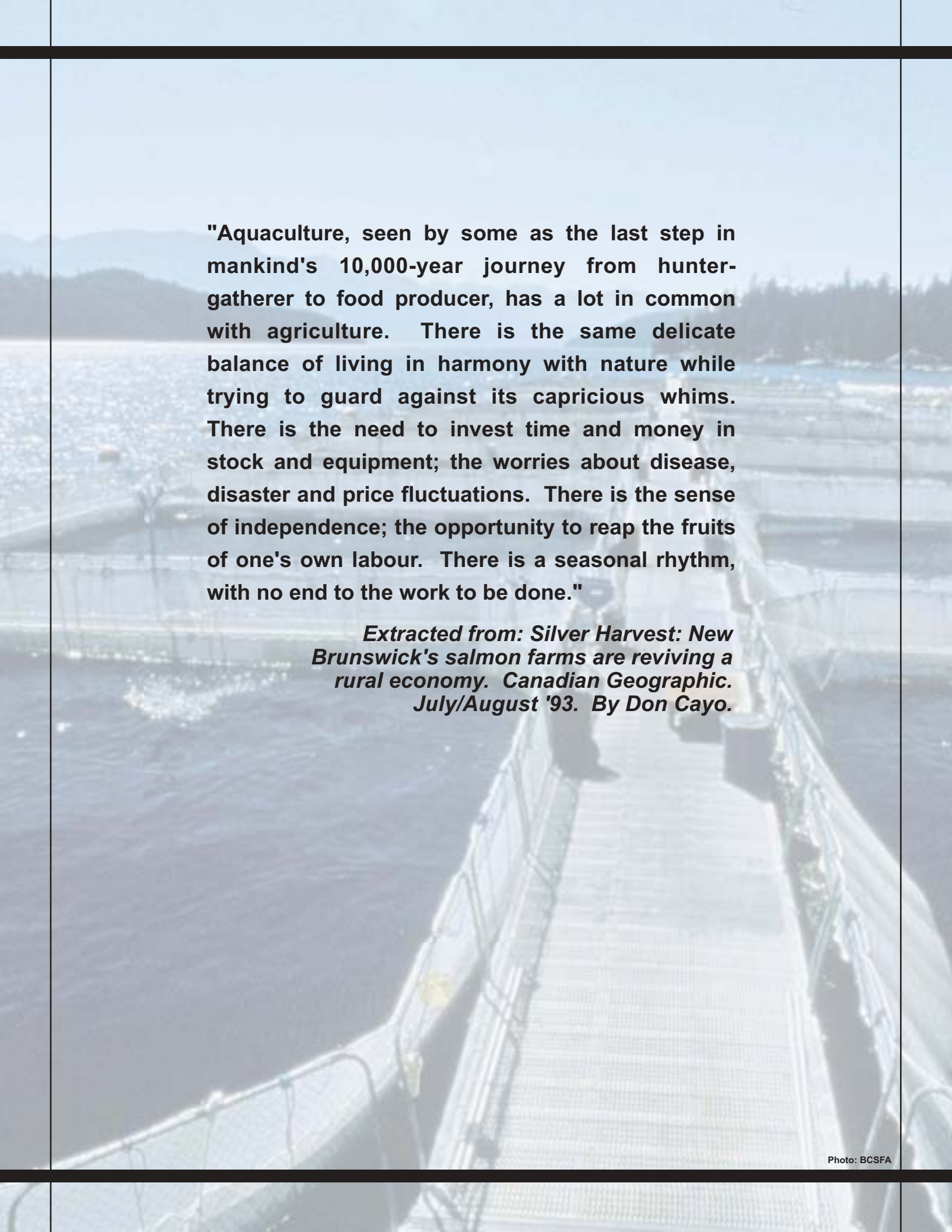

"Aquaculture, seen by some as the last step in mankind's 10,000-year journey from hunter-gatherer to food producer, has a lot in common with agriculture. There is the same delicate balance of living in harmony with nature while trying to guard against its capricious whims. There is the need to invest time and money in stock and equipment; the worries about disease, disaster and price fluctuations. There is the sense of independence; the opportunity to reap the fruits of one's own labour. There is a seasonal rhythm, with no end to the work to be done."

Extracted from: Silver Harvest: New Brunswick's salmon farms are reviving a rural economy. Canadian Geographic. July/August '93. By Don Cayo.

Photo: BCSFA

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Glossary of Acronyms and Definitions

Acronyms:

AAFC	Agriculture and Agri-Food Canada
ACRDP	Aquaculture Collaborative Research and Development Program
APF	Agriculture Policy Framework
BCSFA	British Columbia Salmon Farmers Association
CAIA	Canadian Aquaculture Industry Alliance
CCFAM	Canadian Council of Fisheries and Aquaculture Ministers
CEAA	*Canadian Environmental Assessment Act* or Canadian Environmental Assessment Agency
DFO	Department of Fisheries and Oceans
FADS	Federal Aquaculture Development Strategy
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GM	Genetically Modified
HACCP	Hazard Analysis and Critical Control Points
NAAHP	National Aquatic Animal Health Program
NGO	Non-Governmental Organization
NOAA	United States National Oceanic and Atmospheric Administration
OCAD	Office of the Commissioner for Aquaculture Development
PFRCC	Pacific Fisheries Resource Conservation Council
R&D	Research and Development
SAR	Salmon Aquaculture Review
SOPs	Standard Operating Practices
UN	United Nations
US	United States

Definitions:

Broodstock: Population of mature and breeding animals. Individuals selected for breeding.

Carrying capacity: The capacity of an ecosystem to support healthy organisms while maintaining its productivity, adaptability and capability for renewal.

Crustaceans: Members of the class Crustacea, a large class of arthropods with hard shells, mainly aquatic, e.g. crab, lobster and shrimp.

Enhancement: Actions taken by a public authority to restock fish or to improve the productivity of a pond by modifying its environment.

Molluscs: Invertebrates of the phylum Mollusca, soft-bodied and usually hard-shelled invertebrates such as limpets, snails, cuttlefish, oysters, mussels, etc.

Nutraceuticals: A term applied to dietary supplements and functional foods. Dietary supplements are syrups, tablets, and capsules such as vitamins. Functional foods are staples that have had their nutritional value enhanced with benefit-rich natural extracts.

Phytotoxin: A toxin produced by a microalga consumed by filter feeders and their predators that can be extremely dangerous to humans eating the shellfish.

Sea ranching: An extensive culture system of marine animals, in which hatchery systems are used to rear young individuals which are then released to forage and grow in their natural environment until they are harvested.

Preface

The Office of the Commissioner for Aquaculture Development was established by the Minister of Fisheries and Oceans in December of 1998 to provide advice to the Minister on matters pertaining to aquaculture in Canada. The Commissioner was asked to be the champion for aquaculture within the federal government and to accelerate the implementation of the Federal Aquaculture Development Strategy (FADS), launched in 1995 by the Department of Fisheries and Oceans (DFO).

After a first three-year mandate, during which he released a report entitled "Legislative and Regulatory Review of Aquaculture in Canada", the Commissioner was given an extended two-year mandate (until March 2004) to prepare a long-term vision for aquaculture in Canada and to provide the Minister with specific recommendations on the appropriate federal role to help achieve this vision and fully implement the FADS.

This report outlines the rationale for further investment in the development of a sustainable aquaculture industry in Canada, discusses environmental criticisms and presents a 15-year vision. It concludes with observations on what needs to be done to overcome short and long-term constraints and impediments that keep Canada from achieving its full potential in aquaculture.

During the process of producing this report, we met with many Canadians in all regions of the country. We asked for their input into the formulation of a vision for aquaculture and we were pleased and impressed with their contribution. We also conducted numerous studies, which can be found on our web site:

http://ocad-bcda.gc.ca/emandate.html#Background%20Studies

We encourage readers to consult these studies to learn more about the aquaculture industry in Canada and internationally.

The opinions expressed in this report are solely those of the Commissioner for Aquaculture Development.

"Aquaculture is where future growth will come from, aquaculture is the focus of pivotal policy decisions regarding ownership and management in aquatic environments, aquaculture will have an increasing influence on wild fish stocks and the aquatic environment, aquaculture will dominate the international trade and marketing of many species (especially high-valued species), and competition from aquaculture is an increasingly important catalyst for change in fisheries management."

Anderson, J.L. 2002. Aquaculture and the Future: Why Fisheries Economists Should Care? Marine Resource Economics 17:133-151

Photo: BCSFA

Photos: OCAD

Making a Case for Aquaculture Development in Canada

PART ONE

Aquaculture, the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants, is the fastest growing food production sector in the world. The stocks raised in aquaculture operations are the private property of the aquaculturists, who care for the crop throughout its rearing period by administering basic animal husbandry (e.g. providing housing and feed, protection from predators, veterinary practices, etc.). Upon reaching the preferred market size, the livestock are harvested for processing, sale and consumption. This is the agri-food business model of aquaculture—producers invest in production systems, manage livestock to optimize productivity and co-ordinate sales to earn a return on investment.

In 1986, Canadian aquaculture production amounted to only 10,488 tonnes, valued at $35 million[1]. Growing at an average annual rate in excess of 19 percent, in 2001, Canadian aquaculture output reached 152,523 tonnes, valued at $597 million. This figure represents 13 percent of total fisheries production in Canada and 24 percent of its value. This extraordinary growth, however, has not kept pace with other leading fish-farming nations. In fact, today, Canada ranks twenty-second among aquaculture producing nations and accounts for less than one-third of 1 percent of global farmed fish and seafood production. This level of production falls far below Canada's capacity and capability. Canada has the natural resource base that can enable it to be in the top three global competitors in aquaculture production.

Photo: Gilles Daigle

With a bountiful biophysical resource base and proximity to two of the world's largest, growing seafood markets (the US and Pacific Rim), Canada is well-positioned to be a more significant producer of aquaculture products. However, in Canada's drive to become a leading supplier of fish and seafood, we are also aware of the broader objectives of Canadian society—to bring economic development to our coastal and rural regions in harmony with the social fabric of these communities, while preserving environmental integrity and the culture and traditions of Canada's Aboriginal Peoples. Building upon a solid foundation established by individual entrepreneurs, small and medium-sized businesses and multi-national organizations, the sector has a tremendous capacity to expand and diversify.

Within the next 15 years, it is projected that the Canadian aquaculture sector, growing at 10 to 15 percent annually, could generate in excess of $2.8 billion annually in

1 Unless otherwise indicated, all dollar amounts are in Canadian dollars

farm-gate revenues and provide sustainable, year-round employment to more than 47,000 people living in coastal, rural and Aboriginal communities. Value-added processing and revenues generated in the related supplies and services sector could push the total economic value of the Canadian aquaculture sector beyond $6.6 billion.

The simple existence of this potential, however, will not bring it to fruition. Success, and the realization of our objectives, will require a new era of co-operation and collaboration among all stakeholders and a determination to address and resolve challenges pertaining to both industry and governments. For its part, the federal government can catalyze sustainable development in the sector by providing a cohesive, integrated and co-ordinated federal response to aquaculture. We have seen the positive benefits attained in countries such as Norway, when government guides the sustainable development of aquaculture.

This proposal for a renewed federal policy and regulatory framework supported by strategic program elements lays the foundation for a more appropriate federal response for the support and development of this dynamic industry. A more effective and efficient public service for the regulation and development of aquaculture will enable the industry to realize its potential as a sustainable supplier of farm-raised fish, shellfish and aquatic plants. The resulting benefits to Canadians would include:

- economic and social revitalization in coastal and rural communities in which opportunities for sustainable development can be elusive;
- enhanced participation in the aquaculture sector by Aboriginal Peoples in a manner consistent with native culture, values and traditions;
- increased public confidence in the environmental sustainability of aquaculture and in the Government's ability and intent to manage the sector on a sustainable basis;
- increased industry and investor confidence in the sector, allowing for enhanced private sector financing of industry expansion;
- practical and equitable solutions for the resolution of user-group conflict among stakeholders in Canada's coastal regions;
- enhanced consumer confidence in the safety, health benefits and wholesomeness of high quality Canadian seafood products; and

Photos: OCAD

- broad-based public acceptance of aquaculture, and confidence that aquaculture development is being managed in a manner that is congruent with the values of Canadians.

In its 2002 review of global aquaculture practices, the United Nations Food and Agriculture Organization (FAO) concluded that "public management of aquaculture is not dissimilar to public management of agriculture" and, "in developed economies, management and enforcement costs as a share of the value of the produce are lower for aquaculture than for capture fisheries." Not surprisingly, therefore, the FAO predicts that "public policy support for aquaculture is likely to grow worldwide" as nations, communities and individuals increasingly pursue business opportunities in aquaculture. Furthermore, the FAO notes that aquaculture development "has been of the win-win type, as both producers and consumers have gained when prices for cultured species have fallen as a result of increased production."

In Canada, a nation blessed with an enormous wealth of aquatic resources, the reality of sustainable aquaculture development and the inherent benefits that it offers to all Canadians is within our grasp. Only the strength of our resolve to seize this opportunity limits our potential.

"...aquaculture is here to stay; the challenge is to ensure the young and growing industry develops in a sustainable manner and does not cause serious ecological damage."

Rebecca J. Goldburg and others, 2001
Marine Aquaculture in the United States: Environmental Impacts and Policy Options

Aquaculture and the Transformation of the Fish and Seafood Sector

Photo: BCSFA

> "Consider a meeting of fisheries experts. They debate fisheries management and innovative solutions to the great open-access problems. When they break to eat dinner, it is likely to consist of salmon and/or shrimp. Yet they seem oblivious to the fact that the seafood they are consuming is farmed. They eat the future of fisheries, but continue to discuss its past."[2]

Aquaculture is not a recent undertaking. Historical accounts tell of fish-farming activity in China dating back 4,000 years. In Egypt, ancient tomb friezes depict fish-farming activities over 3,500 years ago. In Canada, proto-aquaculture activities are believed to have been practised by Aboriginal Peoples, while concrete evidence of aquaculture practices trace back to the 1850s when governments engaged in the incubation and hatching of different species of finfish and shellfish. The global (and Canadian) surge in modern aquaculture, however, is quite recent, dating back to the late 1970s.

According to the FAO, two global trends are expected to have a significant impact on fish and seafood consumption—and on aquaculture. First, the global population continues to grow and is expected to increase some 36 percent from approximately 6.1 billion people in 2000 to 8.3 billion people in 2030. Second, global economic growth is enhancing the affluence of many people. Since fish and seafood consumption is proportionate to a population's personal income level, and since the global population is projected to become more numerous and more affluent, the demand for fish and seafood is expected to increase significantly.

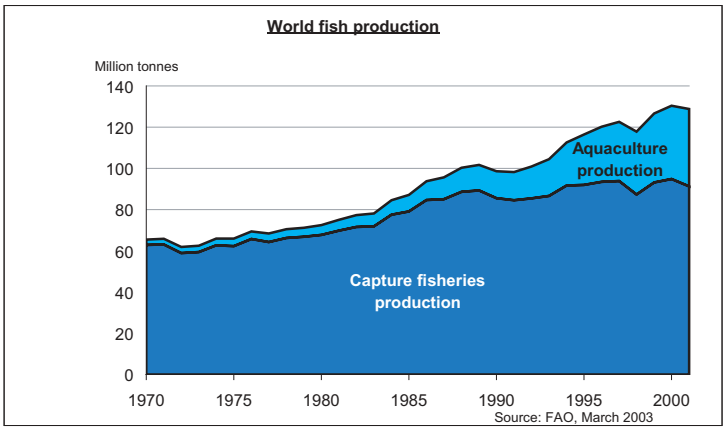
If population expansion, income growth and dietary changes were the only considerations, the FAO projects total seafood demand would reach 183 million tonnes by 2030. Due to supply constraints, however, it is more likely that consumption will increase to only approximately 150 to 160 million tonnes. However, given that only 25 percent of major commercial fisheries are under-exploited or moderately exploited, almost two-thirds are fully-exploited (47 percent) or over-exploited (18 percent), and 10 percent are significantly depleted or recovering from depletion, most fisheries experts agree that global capture fisheries can only provide 80–100 million tonnes of fish per year on a sustainable basis. Therefore, a global shortfall of approximately 50–80 million tonnes of fish and seafood is projected. Aquaculture output will increase to fill this gap, and Canada should be part of this output.

Over the last 15 years, aquaculture has

2 Anderson, J.L. 2002. *Aquaculture and the Future: Why Fisheries Economists Should Care*. Marine Resource Economics 17:133-151.

emerged as an increasingly important contributor helping to supply the global demand for fish and seafood. FAO statistics demonstrate that aquaculture now represents 29 percent of the volume and 38 percent of the value of global fish landings (Figure 1). Moreover, the FAO states that at its present rate of growth, by 2010 aquaculture output will surpass beef production. 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.

Figure 1: World Fisheries Production from 1970-2001



Aquaculture is not only transforming the supply of fish and seafood, it is also having a significant impact on consumption. For example, in the US (Canada's largest export market for fish and seafood), farm-raised species now account for about 30 percent of total per capita seafood consumption, equalling more than 50 percent of all non-canned product. Among the top 10 seafood items consumed in the US, four leading aquaculture products (shrimp, salmon, catfish and tilapia) continue to command an increasing share of consumer choice (Table 1).

By producing a consistent, high-quality product on a year-round basis, the aquaculture sector has been able to provide consumers with a superior level of convenience and value. Today, nine out of ten salmon and tilapia, four out of five mussels, three out of four scallops and two out of four shrimp consumed in the world are products of aquaculture. Not only will this trend continue, but it will also extend to other high-value species.

Hoping to gain on the success of salmon aquaculture, the retail and foodservice sectors are demanding a farm-raised "whitefish" that has the same supply and quality advantages as farmed salmon. Cod is emerging as the likely candidate. In addition, the enhancement of tuna fisheries through aquaculture technologies is developing in Australia and in the Mediterranean region, and it is expected that similar initiatives will develop in the Gulf of Mexico.

Table 1: *Per Capita* Consumption of Seafood in the US (lbs) Top 10 Species 1990 and 2001

	2001	1990	Change
Shrimp	3.40	2.20	55%
Tuna	2.90	3.20	-9%
Salmon	2.02	0.73	177%
Pollock	1.21	1.27	-5%
Catfish	1.15	0.70	64%
Cod	0.56	1.38	-59%
Clams	0.47	0.61	-23%
Crabs	0.44	0.29	52%
Flatfish	0.39	0.57	-32%
Tilapia	0.35	-	2000%
Scallops	0.27	0.30	-10%
Other Species	1.64	3.75	-56%
TOTAL	14.80	15.00	-1%

Source: HM Johnson & Associates (1997; 2002)

At a time when Canadian fisheries have suffered from the reduction of the Pacific salmon and Atlantic groundfish stocks, the enhanced commercial harvest of shellfish has emerged to augment the production and value of the fishery. Today, however, the fishery is largely dependent on three species—crab (especially snow crab), shrimp and lobsters—and the decline in any one of these stocks would have significant consequences for the sector. Moreover, uncertainty surrounds the status of the shellfish stocks and future harvest tonnages cannot be considered secure. In the absence of growth through aquaculture, many of Canada's coastal and rural communities face an uncertain future.

The global boom in aquaculture output has already had a negative influence on Canada's position in the global seafood trade. In the mid-1980s, Canada led the world in seafood export trade. In 1988, Canada fell to second place behind the US; by 1991, Canada fell to fifth place. This drop is significant for Canada, as our share of the world seafood trade has fallen from 7.0 percent in 1988 to only 4.2 percent of a US $ 51.5 billion industry. Among those countries showing gains in the world seafood trade are Thailand, Norway, China and Chile. Economic gains in these countries have come largely through extraordinary growth in the output of farmed fish and shellfish.

Through the managed production of fish, shellfish and aquatic plants, aquaculture presents a sustainable means to enhance the productivity of Canada's fish and seafood sector and provide social and economic stability in our coastal and rural communities. It will also provide an opportunity to regain our former lead position in the international seafood trade.

Photo: BCSFA

Importance of Aquaculture in Canada

Current Status of Aquaculture in Canada

In 2001, the Canadian aquaculture industry produced 152,523 tonnes of fish and seafood valued at $597 million representing roughly 24 percent of the value of total fish landings (Figure 2). Production is dominated by five main categories: salmon 69.0 percent, blue mussels 14.2 percent, oysters 7.0 percent, trout 4.3 percent and steelhead 3.1 percent.

Finfish represents 77 percent of the tonnage and 90 percent of the value of Canadian aquaculture production. From 2000 to 2001, farmed salmon production increased 21 percent to almost 95,000 tonnes. In 2001, shellfish production in Canada surpassed 34,000 tonnes, worth more than $58 million. Blue mussel is the most important shellfish species grown in Canada, followed by oysters and clams.

Today, a total of 72 cold-water species are licensed for rearing in the country. They include 50 species of finfish, 18 species of marine shellfish, two species of amphibians and two species of marine plants. Aquaculture is carried out in all provinces and in one territory.

Aquaculture production is mainly for food but, increasingly, for nutraceutical and medicinal applications. In some First Nations communities, species that were once part of traditional diets but are no longer available in the wild are now being farmed.

Figure 2: Aquaculture production and value for the period 1986–2001

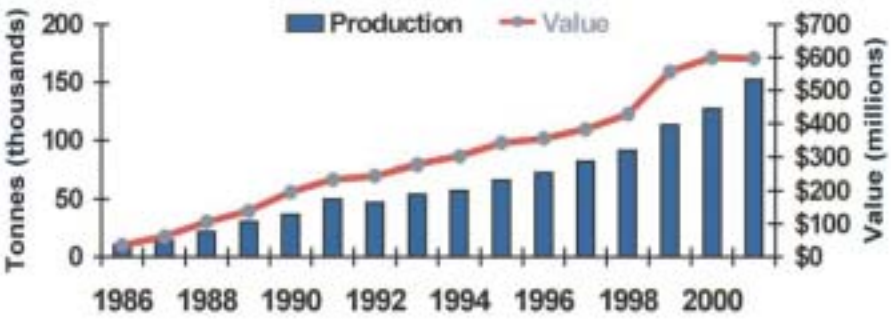


Photo: OCAD

Photo: DFO

Aquaculture Supplies, Services and Technologies

When one thinks about aquaculture, the managed production of fish and shellfish comes to mind. However, a wide range of speciality companies has emerged to fulfil the supplies and services needs of the sector, some of which are identified in the lists below. Moreover, for every person employed in the production of fish and shellfish, approximately one additional person is employed in the related supplies and services sector.

Supplies

- Cage Systems/Fittings/Moorings
- Nets/Netting/Rope
- Aeration/Oxygenation Equipment
- Alarms/Monitoring Equipment
- Veterinary Supplies/Vaccines
- Software Systems
- Feeds and Feeding Equipment
- Filtration Systems
- Grading/Counting Equipment
- Hatchery Equipment
- Fish Processing Equipment
- Packaging Equipment
- Pumps and Motors

Services

- Environmental Monitoring
- SCUBA Diving
- Design and Construction
- Equipment Repair
- Fish Health
- Insurance
- Laboratory Services
- Research and Development
- Product Development
- Genetics
- Training and Skills Development
- Transportation
- Management Consulting

Continued Sustainable Aquaculture Development Represents A Major Economic Opportunity for Canada

During a 2001 strategic planning workshop for aquaculture, a group of industry and government experts were asked to forecast production levels for Canadian aquaculture over the coming 10 to 15 years. It was agreed that the Canadian aquaculture industry could expand to generate approximately $2.8 billion in farm-gate revenue within this time frame. Incorporating gains from value-addition (20 percent of production) and growth in the related supplies and services sector could more than double this value to approximately $6.6 billion in economic activity (Table 2). Moreover, there was consensus among these experts that these projections were not only achievable, but that they were conservative. The key assumptions that were applied in making these projections were that:

- federal and provincial governments establish an appropriate policy and regulatory framework that enables industry to enhance its ability to be internationally competitive;

- the environmental sustainability of the

sector is widely accepted;

- consumer confidence in the quality and wholesomeness of Canadian fish and seafood products is upheld and reinforced;
- industry has secure access to development sites of an appropriate scale to foster international competitiveness;
- US imports of farmed-raised fish and seafood expand at 15 percent annually, as projected; and
- Canada maintains its current 45 percent market share in the US.

Table 2: Production Potential of Canadian Aquaculture

Culture Species	2000 Tonnage (1000 mt)	2000 Value ($ millions)	2010–2015 Tonnage (1000 mt)	2010–2015 Value ($ millions)
Salmonids	84.9	$511	350	$2,100
Cod*	0	$0	128	$545
Other Finfish	0.5	$5	5	$30
Mussels	17.3	$23	52	$69
Oysters	9.3	$14	36	$57
Clams	0.9	$4	4	$16
Other Shellfish	0.1	$0	2	$4
Subtotal	113	$557	577	$2,821
Value-Addition				$500
Supplies & Service				$3,321
TOTAL				$6,642

* Data for cod were modified in 2003

To attain this level of output, the sector would have to grow at a rate of 11 percent to 17 percent annually; a rate that is below the 19.8 percent average annual growth rate experienced between 1986 and 2001. Furthermore, the projections did not include further penetration of new markets, such as the rapidly expanding opportunities in China. It was assumed that this growth would rely predominantly on continuing to service the Canadian and US markets at a level of effort that was no greater than it is today.

While salmonids are anticipated to remain dominant, alternative species including cod, halibut, sablefish and wolffish are also expected to emerge in commercial quantities. Similarly, in the shellfish sector, today's output of mussels, oysters, clams and scallops will be supplemented by an expanded output of farm-raised geoducks, sea urchins and abalone. In the freshwater sector, where Canada has a vast, untapped potential, the farming of cool water and other "specialty" species will emerge to augment the production of trout and Arctic charr.

However, salmon will continue to dominate Canadian aquaculture production. In fact, global estimates project that salmon farming will continue to increase until about 2015, after which production should stabilize. Achieving the projected increased output of farmed salmon in Canada (i.e. 350,000 tonnes) would require the allocation of only 66 new salmon sites of 12 hectares each. In this area of 792 hectares, equivalent to approximately twice the size of Stanley

Park in downtown Vancouver (Figure 3), substantial employment and economic benefits would be delivered to coastal and rural communities on both coasts in dire need of permanent jobs.

The industry is also preparing to diversify its species mix over the next decade. Cod farming is particularly attractive for development in Atlantic Canada, where the cod fishery has been reduced to a shadow of its once dominant stature. The technological capabilities are now in place to farm the species and Canada has excellent rearing conditions for cod. With a growing interest in cod farming coming from both new firms and major salmon farming companies, the industry is poised for development. A recent evaluation of the potential for cod farming in Canada concluded that, within the coming decade, the sector could grow to produce 128,000 tonnes annually, valued at $545 million (Rogers Consulting Inc., 2002). In comparison, Norway is projecting that by 2007 it will produce 190,000 tonnes annually. In British Columbia, sablefish (black cod) farming holds a similar potential to that of Atlantic cod. Through aquaculture, it is quite possible that in the foreseeable future, Canada could surpass its 1982 highest landings of 510,723 tonnes of cod.

Figure 3: Map of Vancouver, British Columbia, showing Stanley Park.

Similarly, a recent study on the economic potential of sea ranching and enhancement projected that, based solely on biophysical capacity, Canada has the potential to generate a landed product value of $1,255 million, producing 15,000 jobs and contributing more than $900 million toward the GDP. This potential exists for nine principal species, including the sea scallop, soft-shell clam, green sea urchin, American oyster, northern quahaug, geoduck, Manila clam, northern abalone and Japanese scallop [3].

The richness and diversity of Canada's coastal and inland aquatic resources provides considerable potential for the cultivation of a variety of species. Consequently, Canada is better positioned than are many Nordic countries to produce a range of species on a significant commercial scale. As the FAO notes, globally, 78 percent of aquaculture production is derived from only 29 species; however, as technologies improve, the number of species commercially cultured will continue to expand to include many more of the commercially valuable species. Canada's natural resource base provides diverse opportunities for production of an expanded range of aquaculture products.

[3] Gardner Pinfold and IEC International. *Economic Potential of Sea Ranching and Enhancement of Selected Shellfish Species in Canada*. Report prepared for OCAD. Ottawa, Ontario: 2001.

Employment Potential and Coastal and Rural Revitalization

While the gross revenue and employment numbers in aquaculture are attractive, the location of the employment opportunities is even more significant. By its very nature, aquaculture exists principally in remote coastal communities, many of which have suffered due to the demise of traditional fisheries and now have few opportunities for sustainable economic development. Aquaculture occurs in those very areas most in need—areas where other industries have difficulty taking root and remaining competitive. Aquaculture has already had a considerable positive impact, leading to the revitalization of many such communities and providing hope where there was despair.

Across Canada, aquaculture has stimulated the economies of many communities, including:

Newfoundland:

Bay d'Espoir	Salmon, Steelhead, Cod
Notre Dame Bay	Mussels, Salmon, Cod
Trinity Bay	Mussels

Nova Scotia:

Bras d'Or Lake	Salmon, Steelhead
Mahone Bay	Mussels

New Brunswick:

Bay of Fundy	Salmon
Northumberland Strait	Oysters, Mussels
Acadian Peninsula	Oysters, Mussels

Prince Edward Island:

Murray River	Mussels
New London Bay	Mussels
Malpeque Bay	Oysters, Mussels

Québec:

Îles-de-la-Madeleine	Mussels, Scallops

Ontario:

Manitoulin Island	Rainbow Trout

Saskatchewan:

Lake Diefenbaker	Rainbow Trout

British Columbia:

Campbell River	Salmon
Clayoquot Sound	Salmon
Quatsino Sound	Oysters, Clams
Fanny Bay	Oysters
Baynes Sound	Oysters, Clams
Queen Charlotte Strait	Salmon

Yukon:

Whitehorse	Arctic Charr

Photo: DFO

Photo: BCSFA

In 2001, the Canadian aquaculture sector employed some 12,390 people (Table 3). According to the Canadian Aquaculture Industry Alliance, approximately 90 percent of these jobs are located in rural and coastal communities, and two-thirds of all workers are under the age of 35. Aquaculture development has proved to be a revitalizing social and economic force in rural Canada. As part of the new economy, the sector offers real opportunities for well-paying jobs, providing meaningful year-round employment and a reason for youth to remain in these communities.

If the projections for Canadian aquaculture output are reached and allowance is made for a 25 percent increase in labour force productivity, within the coming 10 to 15 years, total employment in the sector will approximate 47,000 individuals. Moreover, the vast majority of these 47,000 jobs would be created in coastal and rural communities, where they are most needed. At present, and for the foreseeable future, there will be a chronic shortage of qualified workers to fill the growing number of job vacancies in the sector.

Table 3: Direct and Indirect Employment in Canadian Aquaculture (2001)

Operations	Direct	Indirect	Total
Marine Finfish [4]	4,110	2,942	7,052
Shellfish[4]	3,374	534	3,908
Aquatic Plants[4]	170	n/a	170
Freshwater[5]	893	367	1,260
TOTAL	8,547	3,843	12,390

4 Chopin, T. and S. Bastarache. *Finfish, Shellfish and Seaweed Mariculture in Canada*. Bull. Aquacult. Assoc. Canada, 2002. 102-3:119-123.

5 Doyon, M., I. Charron, S. Julien and É. Gilbert. *Value and Economic Impact of Freshwater Aquaculture in Canada: Current State (1999) and Potential for Development*. Report prepared for the Office of the Commissioner for Aquaculture Development (OCAD). Ottawa, Ontario: 2001.

Charlotte County, New Brunswick - *An Aquaculture Success Story*

Over the last decade, Charlotte County, in southwest New Brunswick, has experienced significant economic growth due to aquaculture—specifically salmon farming. While this rural area was previously faced with high levels of unemployment, the county is now a significant hub for Canadian aquaculture production. In fact, its economic growth is so significant that it has become necessary to recruit workers from outside the region.

Today, several of Charlotte County's largest employers are involved either directly or indirectly in the aquaculture sector [6]. Aquaculture now accounts for more than 3,000 full-time jobs in the local area, representing 25 percent of the entire workforce[7,8]. In 2000, the salmon farming industry generated direct employment equivalent to 1,683 person-years (PY's) consisting of: 19 hatcheries: 157 PY's; 41 farming companies operating 96 marine cage sites: 624 PY's; 10 processing plants: 537 PY's; direct services: 240 PY's; and selling, administration and other: 125 PY's. Direct employment wages, salaries and benefits expenditures were estimated at $47 million[9].

Photo: OCAD

In the related supplies and services industries such as boat building, net and cage manufacturing, machine shops, etc., it is estimated that an additional 2,962 jobs have been created. Assuming the indirect wages are based on the mean income from the census data, these positions would add close to $46 million to regional payrolls.

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6 Fundy Region Development Commission Inc. On line: http://www.frdc.ca/our_economy.htm . April 24, 2002.

7 Cooke, G. and L. Stewart. Presentation to the Standing Committee on Fisheries and Oceans. Ottawa, Ontario: House of Commons. December 6, 2001. Online: http://www.parl.gc.ca/InfoComDoc/37/1/FOPO/Meetings/Minutes/FOPOmn34%281413%29-E.htm

8 Atlantic Canada Opportunities Agency (ACOA). News Releases, September 17, 1998. On line: http://www.acoa.ca/e/media/press/press.shtml?958

9 Stewart, L. *Salmon Aquaculture in New Brunswick. Natural Development of Our Marine Heritage*. Aquaculture Strategies Inc. 2001.

Aboriginal Opportunites in Aquaculture

A significant challenge facing both the Canadian government and First Nations leadership is the creation of a sustainable economic base for First Nations communities. While the modern, global economy is having considerable success with providing employment and generating wealth, this success is limited to those countries which can offer the advanced education, training and mobility needed to participate in this increasingly knowledge- and urban-based economy. Those in rural areas are not able to fully participate. This is particularly true for First Nation communities. Moreover, there is an inherent lack of mobility among First Nations people and the survival of unique First Nations cultures is linked intrinsically to the resource base of their traditional territories.

To help rectify this situation, long-term, sustainable employment opportunities are required–not short term, make-work projects.

Among some First Nation communities, there is considerable discontent regarding aquaculture, particularly with respect to finfish farming and especially in British Columbia. In other First Nation communities, however, aquaculture has proved to present a powerful opportunity for the development of a sustainable economic base. In many regions of Canada, First Nations have unique access to aquaculture development sites, when the primary constraint on industry growth in the area is, in fact, site availability. Aquaculture also fits well with the skills held by much of the potential work force in these communities. Recognizing this opportunity, those First Nations that have established aquaculture operations have found that the industry can provide stable employment and wealth for the community, thereby producing resources that can be channelled into areas of need.

Table 4: First Nations Involved in Aquaculture in Canada, 2003

First Nation	Location	Culture Species
Miawpukek	Conne River, NL	Salmon, Steelhead, Oyster
Eskasoni	Cape Breton, NS	Salmon, Trout, Striped Bass
Cape Croker	Wiarton, ON	Rainbow Trout
Wikwemikong	South Baymouth, ON	Rainbow Trout
Aundeck Omni Kaning	Little Current, ON	Rainbow Trout
Rainy River	Emo, ON	Sturgeon
Akwesasne	Cornwall, ON	Perch
Tla-o-quiaht	Tofino, BC	Shellfish
Klahoose	Campbell River, BC	Clams, Oysters, Scallops
Sliammon	Powell River, BC	Clams
Quatsino	NW Vancouver Island, BC	Shellfish
Snuneymuxw	Nanaimo, BC	Clams, Oysters
Ahousaht	Tofino, BC	Clams, Oysters, Salmon
Kitasoo Xaixais	Klemtu, BC	Salmon
Kyuquot	NW Vancouver Island, BC	Salmon
Huu-ay-aht	NW Vancouver Island, BC	Abalone

Today, aquaculture ventures exist in at least 16 First Nation communities across Canada (Table 4). However, the present level of aquaculture development amongst First

Nations is not reflective of the potential that exists. A preliminary analysis [10] conducted for the Department of Indian and Northern Affairs in 2001 by a team of aquaculture experts and First Nations business development specialists suggested that:

- approximately 130 First Nations may have the potential to develop trout farms;
- approximately 61 coastal First Nations have access to sites which could support salmon farms; and
- approximately 123 First Nations have access to sites with the potential for clam, mussel, and/or oyster farming.

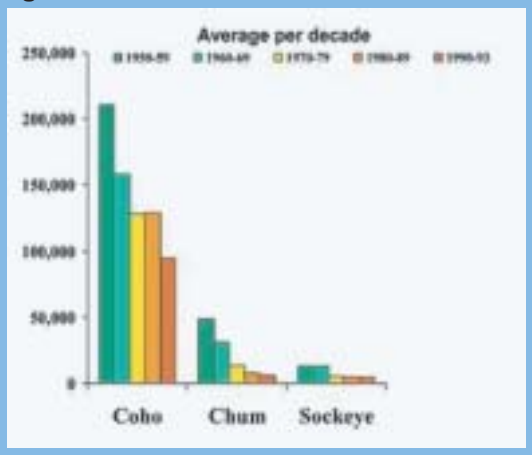
Photos: DFO

10 Canadian Aquaculture Systems, Inc. (2001). *Opportunities in Aquaculture for First Nation Communities*. Dept. of Indian and Northern Affairs. Ottawa, Ontario.

Kitasoo/Xaixais First Nation Salmon Farming Success Story

Located in Klemtu, some 480 kilometres north of Vancouver on the BC central coast, the Kitasoo/Xaixais First Nation is a relatively small (718 hectares) and isolated community with no year-round road access. The on-reserve population of 460 people is predominantly young and growing, having doubled over the last 20 years. Moreover, this growth rate is expected to continue.

Figure 4: Wild Salmon Returns 1950 - 1993



Source: www.kitasoo.com

For generations, the economy of the community was sustained by the commercial and food fisheries. Since the 1950s, however, the returns of wild salmon have fallen dramatically, resulting in a severe loss of employment and leaving the community without a sustainable economic base (Figure 4).

In response to this situation, the Kitasoo/Xaixais people chose to diversify their economy. They developed an economic revitalisation plan that focused upon sustainable opportunities in tourism, forestry and aquaculture. The community decision to develop these sectors was contingent upon maintaining the environmental, cultural and ecological values of their territory and protecting fish and wildlife habitats. Maintaining a balance between these traditional values and the needs of their community for economic prosperity and sustainable employment is critical to success.

In partnership with Marine Harvest Canada, a commercial salmon farm was developed in the Kitasoo/Xaixais territory. In addition, through distance education, North Island College delivered practical aquaculture training to provide community members with the requisite skills. Today, salmon farming accounts for one-half of the local economy of the Kitasoo/Xaixais people (Figure 5) and is a source of community pride.

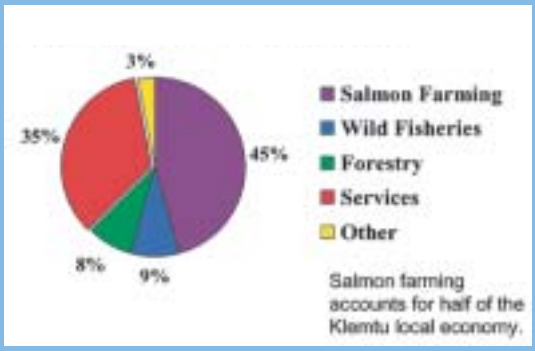
Photo: Kim Stallknecht

In deciding to pursue aquaculture via a joint-venture agreement with Marine Harvest Canada, the Kitasoo/Xaixais First Nation was adamant that the environmental

integrity of their traditional territory not be compromised. They were particularly concerned that Marine Harvest's fish-farming activities might reduce the fisheries harvests for other community members. Consequently, the Kitasoo/Xaixais community retained final decision-making powers in all matters pertaining to environmental impacts and decisions, making it clear to Marine Harvest Canada that if the farm was found to be the cause of environmental degradation, it would be shut down without hesitation.

Today, the Kitasoo/Xaixais First Nation and Marine Harvest Canada operate three salmon farms that are certified under an ISO 14001 environmental program and are subject to extensive independent monitoring. After four years of operations, fisheries harvests have not declined and the environmental integrity of the region remains intact. Chief Councillor and Band Manager Percy Starr of the Kitasoo/Xaixais First Nation proudly claims that "no one should be fooled into thinking that BC's Kitasoo First Nation had sold out and sacrificed any part of its environmental heritage in order to become part of the salmon-farming industry."

Figure 5: Employment by Sector, Klemtu 2001



Building on Canada's Capacities and Capabilities

Photo: BCSFA

At 243,792 kilometres, Canada's coastline represents 25 percent of all coastlines in the world. Canada also possesses 16 percent of the world's fresh water in the form of more than 3 million lakes and rivers covering more than 755,000 square kilometres. With an abundance of suitable sites for raising aquatic animals, the biophysical potential for aquaculture in Canada is tremendous. Moreover, the Canadian government, both at the national and provincial levels, encourages aquaculture as a sustainable means of economic development.

Canada's fisheries history dates back more than four centuries, over which time Canada has developed a respected international reputation for providing high-quality, high-value seafood from cold, clean waters. This history has also positioned our nation as a global leader in the processing, marketing and distribution of seafood, with a well-established physical, technological and managerial infrastructure.

Demand for seafood in Canada's major export markets is growing at a faster pace than the traditional fishery can service. This is particularly true in the US, our largest export market for fish and seafood, where the strong demand for high-quality fresh seafood will continue to fuel growth in Canada's aquaculture production.

Canada's salmon farming sector is the world's fourth largest, following Norway, Chile and the United Kingdom. Several of the leading, multi-national aquaculture corporations are ready to expand their Canadian operations, if an enabling policy and regulatory environment is created. Expanding the sector through this proven industry base will minimize developmental risks and will help to establish larger regional clusters in which ventures of all scales can prosper.

Twenty-plus years of experience in commercial aquaculture has allowed Canada to develop a skilled and experienced workforce in the sector, from basic technical labour through to managerial expertise. The training and education infrastructure established to support the sector is also first rate, providing knowledge services in Canada and abroad. This infrastructure also provides an excellent opportunity for exploratory and development research that will enhance productivity and sustainability.

All told, Canada has considerable potential to be a significant global player in commercial aquaculture and a leading contributor to the development and promotion of sustainable aquaculture technologies. With a vast biophysical resource base, experience and expertise in the production, processing, distribution and marketing of fish and seafood, coastal

infrastructure to expand upon and Aboriginal opportunities and interest, Canada is well positioned to be a leading, internationally competitive producer of farm-raised fish and seafood.

A Future for Cod

In 1497, while searching for a sea route to China, John Cabot discovered a "new found land" that was teaming with fish. News of this discovery soon brought scores of fishing boats from Europe to the eastern shore of North America to harvest the riches of the sea. And for nearly 400 years, the seemingly inexhaustible stocks of the Grand Banks were a source of industry, international trade, prosperity, employment and pride.

Photo: NOAA

Over the Grand Banks, a large and relatively shallow coastal region, a mixture of cold arctic currents and warm tropical currents create a nutrient-rich habitat capable of supporting fish by the billions. In the twentieth century, however, technology had advanced to the point where fishermen were able to hunt down stocks with increasing precision and collect them from the sea with an unprecedented efficiency. Technologies had advanced to the point where fish could be harvested faster than scientists and regulators could collect the data and information required to impose the quotas and fisheries restrictions needed to protect the stocks. In 1992, the unthinkable happened—the mighty Northern cod stocks of Atlantic Canada were severely threatened and the fishery was closed. Today, after more than a decade of intensive conservation measures, cod stocks remain at less than 2 percent of their historical levels and show little sign of recovery. This situation necessitated the closing of the remaining Gulf of St. Lawrence cod fisheries by the Minister of Fisheries and Oceans in May 2003. As a result, fishing boats that had plied the seas for nearly four centuries are tied up, processing plants have been shut down, thousands of people are unemployed and entire communities have been left without an economic base.

Photo: http://www.stemnet.nf.ca/cod/627no16.jpg

As we embark upon the twenty-first century, however, aquaculture technology may come to the rescue of cod. By adopting technologies developed for other marine species such as turbot, halibut and sea bass, it is now possible to breed cod in hatcheries by the millions for commercial production in sea cages. Already, Norway has issued no less than 280 cod-farming licenses, and this year, three million hatchery-reared juveniles have been stocked into cages. It is projected that more than 64 million juveniles will be produced by 2005, which, in theory, should

yield more than 190,000 tonnes of cod by 2007. By 2015, estimates suggest that Norway could be producing more than 400,000 tonnes of cod.

It is projected that Canada has the capability to produce 128,000 tonnes of cod, valued at more than $545 million, by 2015. This level of production will require development of four to six commercial cod hatcheries capable of producing about 40 to 45 million juveniles annually. Grow-out (including sites for year-class separation and fallowing) will require approximately 120 marine sites of 20 hectares each, or 2,400 hectares. In fact, today more than 160,000 cod are already in cages in Newfoundland, broodstock have been developed, more than a dozen marine grow-out sites have been approved and, in the autumn of 2003, Canada's first commercial cod hatchery will commence production.

Through aquaculture there is an exciting and prosperous future for cod, which is destined to re-emerge as a favourite entrée on dinner tables around the world.

Photo: Dan Stechey

Aquaculture and Biotechnology

Photo: BCSFA

Aquaculture is a knowledge- and technology-intensive sector. The pursuit of increasingly productive and sustainable practices drives an environment of continuous learning and advancement. As significant new technologies, processes and products emerge, the competitiveness of Canadian companies is enhanced. Moreover, Canada has earned an international reputation in the aquaculture sector as a sustainable supplier of high quality and safe fish and seafood. As a result, many Canadian knowledge-based companies are at the forefront of the aquaculture supplies and services sector. Therefore, continued aquaculture development also presents an opportunity for Canadians to export equipment, knowledge and services to a global market.

Other industrial opportunities exist in aquaculture that have yet to be fully explored, including marine plant production for food and nutraceuticals, advanced processing of value-added products and by-products and the development of pharmaceuticals and other biotechnologies. Today, the potential impact of such developments on the scope and nature of aquaculture can only be imagined.

For example, the production and marketing of marine-based nutraceuticals such as omega-3 fatty acids and chitosan is already an expanding sub-sector, contributing to a nutraceutical and functional foods market that some analysts estimate may exceed US$ 250 billion within 5 to 10 years. Furthermore, clinical trials have shown that some marine bioactive compounds have anti-cancer, anti-viral and anti-inflammatory properties. Undoubtedly, organisms can be produced, using aquaculture technologies, to specifically generate and harvest such products.

Today, research is also being conducted in order to acquire a better understanding of the potential benefits of genetically modified fish. Conducted in secure, fully contained land-based research facilities, this research is showing potential for reducing the costs of production in some fish species and for the production of human insulin by other fish species.

Thus, looking beyond the conventional production of food, it appears inevitable that aquatic biotechnology will also be harnessed to improve the growth, disease resistance and performance of a number of fish and shellfish species and for the manufacture of functional foods and medicines.

Aquaculture and the Environment

"Today, fishing is the largest extractive use of wildlife in the world."[11]

Photo: NOAA

It is clear that aquaculture is sustainable from both a seafood business point of view and a socio-economic perspective. What is less clear to some Canadians, however, is that aquaculture is also environmentally sustainable.

Photo: BCSFA

Whether through farming, fishing or aquaculture, all human activities of a scale significant enough to produce food also have an environmental cost.

In agriculture, for example, the creation of a farm field requires cutting down the existing forest and removing most of the plant and animal life. This usually means the disappearance of the original ecosystem and food web. Furthermore, agriculture practices continue to have other direct and indirect consequences to the surrounding environment on an ongoing basis. Despite these environmental implications, the agriculture sector in Canada enjoys large support from Canadians.

"There is growing awareness that aquaculture can be the most ecological way to increase the global food supply in the next 20 years".

K. Dun Gifford, President and founder of the Oldways Preservation and Exchange Trust

Obviously, Canadians do not expect to feed their families by gathering wild fruit or hunting deer and moose. This practice would not be environmentally sustainable. Canadians accept farming as a necessary activity and expect their governments to ensure that it is practised in the most sustainable way possible. Moreover, despite its environmental impacts, most Canadians are proud of their agriculture sector and fully support government policies to assist the sector.

Photo: 2000-2001 Aerial Farm Statistics Inc.

The reality is that the Canadian agriculture sector is an innovative and competitive industry. It continues to improve its environmental performance and provide high quality, safe food for domestic and

[11] World Fish Center. 2002. Fish for All: An Issue for Everyone. A Concept Paper

foreign markets while creating jobs and economic activity in our rural communities and maintaining the social fabric of Canada.

Being nothing else than farming in the water, aquaculture should enjoy the same kind of support from Canadians. Up to now, this has been the case, as evidenced by several opinion surveys that have demonstrated a consistently large support from Canadians for aquaculture.

Unfortunately, this support is currently eroding due to a growing public perception that aquaculture is a polluting industry that puts our ocean environment and wild stocks at risk and markets fish that are unsafe for human consumption. The reality is that the aquaculture industry in Canada is an environmentally sustainable industry that meets the highest standards of quality and food safety.

In order to really understand how aquaculture is environmentally sustainable, it is important to:

- reflect upon its environmental implications in a more global context;
- separate myths from facts with regard to environmental impacts; and
- analyse the measures put in place in recent years to ensure adequate environmental protection.

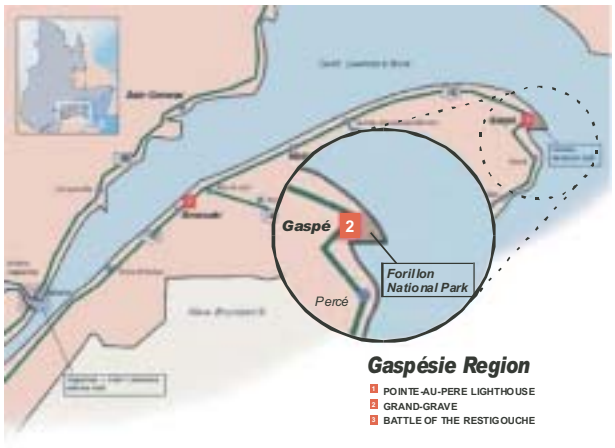
Environmental Implications of Aquaculture in a More Global Context

In 2002, the total area occupied by aquaculture operations in Canada was 30,971 hectares (OCAD, 2002), which is slightly larger than the area occupied by Forillon National Park (See Figure 6). It is equivalent to an area measuring 17.6 km long by 17.6 km wide, which is roughly the size of the core area of almost any one of Canada's provincial capital cities.

On this tiny area of our Canadian aquatic resource base, the aquaculture industry produced approximately 24 percent of the value of all Canadian fish landings (fisheries and aquaculture combined).

There is no doubt that aquaculture activities practised on this minuscule portion of our aquatic ecosystem produce a certain level of environmental impacts. But an objective and strategic assessment of these environmental impacts cannot be done without taking into account the fact that the approach used to produce the other 75 percent of the value of Canadian fish and seafood landings—the commercial fisheries—also has an environmental cost.

Figure 6: Map Showing Forillon National Park



The reality is that aquaculture produces a new fish biomass with a certain level of impact on a small, localized portion of our aquatic ecosystem, while commercial fisheries remove large amounts of wild biomass from the ecosystem with a certain level of impact on a large portion of the same ecosystem.

In fact, aquaculture should be viewed as a good candidate to become a model of sustainable development, contributing towards the long-term protection of Canadian aquatic ecosystems.

Facts and Myths about Environmental Impacts from Shellfish Aquaculture

The culture of mussels, oysters and clams in Canada is generally considered to pose a low environmental risk. Molluscs are filter feeders, and their presence in an environment is often used as an indicator of the quality of the environment. By removing suspended particles, molluscs can contribute towards improving the quality of the environment in areas or bays.

Due to the fact that they extract their food from the surrounding environment, it is important to consider the carrying capacity of a specific area when siting mollusc culture operations. If not properly sited and monitored, large-scale operations could have consequences on water circulation, sedimentation regime and accumulation of organic material on the bottom of the ocean. Most shellfish operations are well sited, adequately regulated and of a small enough production to avoid such problems.

Most of the opposition to mollusc aquaculture is based more on conflicts with other users than on environmental considerations. The leasing of private mollusc culture tenures is often viewed by other users as an infringement on their rights, e.g. public access to water for land owners, general access to beaches for citizens, the right to navigation for all types of boaters, access to the resource for fishers, pristine views for cottage owners, etc. This not-in-my-back-yard syndrome can be overcome through pro-active planning of aquaculture sites, and comprehensive and transparent consultation processes and conflict resolution mechanisms.

Photo: PEI Dept. of Fisheries, Aquaculture and Environment.

Facts and Myths about Environmental Impacts from Finfish Aquaculture

Salmon farming has been the object of criticism in Canada over the last two years. Many of these criticisms are unfounded and are not based on recent data on the environmental performance of the salmon farming industry while other criticisms are valid.

The Salmon Aquaculture Review, published in 1997, was a comprehensive and independent review of all of the environmental risks that are due to salmon farming. It concluded that salmon farming, as currently practised in BC and at current levels, presents a low overall risk to the environment. Since the publication of the Review, many other reports, analysing the same basic environmental risks, have been done on the same subject.

Table 1 in Appendix I summarizes the results of two credible, comprehensive and recent papers on the magnitude of the environmental risks involved with the practice of salmon farming, and compares these with the results of the Salmon Aquaculture Review.

In summary, Table 1 shows that many environmental concerns are based on outdated information or old practices and technologies, or have been exaggerated. At the same time, the table highlights other environmental concerns that are legitimate and require immediate attention by government and industry.

Some critics have raised the issue of the large amount of fish meal and fish oil being used in the composition of fish feed and consequently contributing to further depletion of the oceans and removal of valuable fish resources for human consumption. The reality is that the fisheries responsible for the production of fish oil and fish meal are stable and sustainable, and are based on fish that were never used for direct human consumption. Aquaculture uses only about one third of available fish meal and fish oil; the rest is used for other livestock production, such as poultry and pork, as well as for pet food.

Concerns have also been expressed about genetically modified (GM) fish being raised in Canadian waters. The reality is that there are no GM fish in commercial production in Canada. Moreover, the Canadian Aquaculture Industry Alliance has a clear policy against the use of GM fish in commercial production until it has been scientifically demonstrated that they are fully safe for consumers and the environment. The only GM fish raised in Canada are in completely contained, land-based research facilities and are used for a variety of research projects, including the possible use of these fish for the production of insulin for humans.

Overall, sustainability resides in developing best management practices and government policies and regulations to reduce to an acceptable level all potential environmental impacts resulting from open net cage finfish culture operations, and to carefully locate these activities in well planned and well managed aquaculture areas or zones.

How Industry and Government Policies and Regulations Address Environmental Concerns

Regulating a private activity in public waters is a highly complex challenge, and requires new approaches. A number of measures have either been implemented or are in the process of implementation, the goal being to improve the environmental performance of the aquaculture industry in Canada. The implementation of these measures within a short timeframe is a clear reflection of the commitment of the aquaculture sector to address environmental concerns. It also illustrates the importance attached by both levels of government to environmental concerns.

Furthermore, the specific recommendations issuing from this report will complete the overall set of federal, provincial, and industry measures already established to protect the environment. New measures may be required to set the (federal) compliance standards for conducting aquaculture in Canada when it comes to environmental sustainability. These rules should be consistent with recommendations submitted in June 2000 in the report entitled "Legislative and Regulatory Review of Aquaculture in Canada".

The government's framework for managing environmental risk needs to be flexible enough to take into consideration the realities of scarce enforcement resources, a rapidly evolving sector and constantly changing technologies and practices. Many existing and proposed measures have been designed in the context of risk management, smart regulation and adaptive management approaches. We must consider new approaches that involve the industry, while ensuring that adequate government monitoring, regulation and enforcement continues to exist to ensure full compliance and that sanctions are imposed when necessary.

It is essential to highlight the fact that each aquaculture operation in Canada (except shellfish bottom-seeding where there is no physical change to the seabed) must undergo an environmental assessment under the *Canadian Environmental Assessment Act* (*CEAA*) before being granted federal approval. In combination with ongoing federal and provincial environmental monitoring programs, aquaculture projects being subjected to environmental assessments ensure that no unforeseen, significant negative consequences on the environment arise from aquaculture operations.

In summary, although this industry is young (30 years old or less), it has already demonstrated a high level of environmental stewardship and has significantly improved its environmental performance in recent years. Although ongoing improvement is still needed in some areas, this sector has become a model of sustainable development that meets the highest environmental standards.

Aquaculture in Canada, What is Holding us Back?

Photos: OCAD

PART TWO

For 20 years, since the first National Aquaculture Conference sponsored by DFO and the Science Council of Canada in 1983, aquaculture has been regarded as a significant and sustainable economic development opportunity for Canadians. This remains the situation today. At that conference, it was specifically noted that "A more proactive role for governments [in aquaculture] was advocated[12]." For 20 years, however, reality has fallen well short of the vision. And why has this been the case in Canada but not in other, similar countries?

Since 1983, many national initiatives have been announced by the federal government to support aquaculture development, starting in 1984 with the determination of DFO as the lead federal agency for aquaculture by the Prime Minister. In 1986, federal and provincial Fisheries Ministers agreed on a statement of national goals and principles for the development of aquaculture.

Between 1986 and 1989, the federal commitment resulted in the signature of MOU's with the provinces on respective responsibilities with regard to aquaculture development. In 1988, the Standing Committee on Fisheries and Oceans launched a report entitled *Aquaculture in Canada* which recommended that the Minister of Fisheries and Oceans take a proactive role in supporting aquaculture development in Canada. In 1990, DFO launched a Strategy for the Development of Aquaculture.

After two national aquaculture planning forums had been held, in 1995, DFO launched the Federal Aquaculture Development Strategy (FADS) with the support and collaboration of the provincial governments, 17 federal departments and agencies, and all stakeholders.

With the FADS, the federal government re-confirmed DFO as the lead federal agency and specified that this lead federal role was two-fold: regulatory and development. In preparation for the1997 election, the Liberal government announced a Red Book commitment for federal support to aquaculture that led to the creation of a commissioner for aquaculture development in 1998.

Meanwhile, since 1983, the federal government has, through various programs, invested significant financial resources in aquaculture.

Despite much good effort and some successes, it is fair to say that the federal government has been unable to achieve for the sector all that was expected. Despite its enormous biophysical potential, Canada

12 Pritchard, G.I. (1984). Preface - Proceedings of the National Aquaculture Conference: Strategies for Aquaculture Development in Canada. Can. Spec. Publ. Fish. & Aquat. Sci. 75

Photo: OCAD

continues to lag behind other countries in aquaculture growth. Many of our key markets are under pressure from countries such as Chile, where aquaculture has been embraced and supported by the national government.

The current regulatory approach for aquaculture is being challenged by many stakeholders. This approach has not garnered public confidence, nor has DFO been able to sustain its costs. The industry is finding that the costs of supplying information and meeting regulatory requirements are high compared to other countries. More importantly, the lack of predictability and consistency of the process makes it difficult for investors to justify investing in Canada.

Other federal departments with an interest in aquaculture development are becoming concerned over the apparent confusing signals that the federal government is giving. We support the growth of the industry, but we make it difficult to obtain new sites.

The legislated mandate of DFO is to conserve wild stocks and to protect the marine environment. This mandate is constitutionally enshrined. It is what Canadians expect. The department has been wrestling with the development role described in the Federal Aquaculture Development Strategy. Aquaculture has been somewhat of an orphan within the department, under-resourced and never fully understood. Indeed, aquaculture has been at the centre of an internal conflict within DFO for some time.

Perhaps we must ask whether the federal government is taking the correct approach with respect to this industry. In many other sectors, the federal government has been clear in its desire and ability to support growth. We have seen major public investments in biotechnology, aerospace, communications, and agriculture to name a few, combined with the appropriate programming. This has not been the case for aquaculture. We continue to treat this industry as a subset of the fishery rather than as the agri-food business that it is. The principal federal environmental regulator of the industry has been asked to be responsible for leading the growth and development of the industry.

It is time to re-assess past decisions. Having said this, it is clear that DFO will always play an important role in the evolution of the aquaculture industry. DFO bears the brunt of the federal responsibility for ensuring (and convincing Canadians) that aquaculture is environmentally sustainable. This is an enormously important responsibility and one to which the department has directed considerable effort. Due to these efforts, we are close to the point at which the environmental rules of the game will be finalized. Since most of our competitors are wrestling with the same issues surrounding environmental protection, Canada will come out of this process well placed to be a world leader in environmental protection.

However, we need more than good environmental protection regulations. We need an overall policy approach that recognizes the farming nature of aquaculture, combined with equitable and affordable programming that responds to the developmental needs of the sector.

Getting the Policy Right

Photos: OCAD

PART THREE

Aquaculture is a farming—not fishing—industry. Aquaculturists own their stocks and operate on private or leased properties. Aquaculture is a modern agri-food business that has very little in common with wild fisheries (a hunting type of activity), except for the fact that the farming medium is water and that saltwater aquaculture is practised in a coastal environment that belongs to the common property of all Canadians.

It can be argued that the origin of aquaculture in Canada is closely related to fisheries. Early in Canadian history, fisheries officers used aquaculture techniques to improve the success of reproduction or the survival rate of juveniles in support of several commercial fisheries species. The release of hatchery-raised salmon smolts on both coasts of Canada to increase wild production is a good illustration of the fisheries origin of Canadian aquaculture.

This interest of the fisheries sector in increasing artificially wild populations of commercial species has also contributed to the creation of a strong R&D interest among fisheries scientists. Over the years, Canadian fisheries researchers have developed an expertise in hatchery techniques, nutrition and fish health, resulting in a strong aquaculture science domain within the fisheries sector. It is well known that an important part of the science used to develop the huge salmon farming industry in Norway came from Canadian fisheries scientists.

These facts help explain, in 1984, why the Canadian government assigned to DFO the responsibility of being the lead federal agency for aquaculture. At that time, it was clear that all the federal aquaculture expertise resided in DFO and that there was a genuine interest within the department to develop the sector.

Unfortunately, in the 1990's, DFO initiated a long process of policy re-orientation that resulted in key policy decisions which had significant impact on the development of aquaculture in Canada. The department went through a series of program reviews and policy orientation exercises that led to a strong refocusing of the departmental mandate towards the conservation of wild stocks.

This focus on conservation has provoked an intense internal debate within DFO over the legitimacy of supporting the development of a sector (aquaculture) that could have a negative impact on the wild stocks. Another key consequence of the department's decision to reduce its focus on aquaculture has been that Canadian public policy on aquaculture is now derived directly from fisheries policy, which is unable to take into account the unique nature of water farming.

Aquaculture is a modern agri-food business in urgent need of an agri-food approach and expertise that will better understand its needs and support its development. It is clear that, in the Canadian context, the environmental sustainability of the sector is a key cornerstone for any further development, and that DFO is ideally positioned to help this industry to become a model of sustainable development and an activity which is well regarded by all Canadians.

But it is equally important to recognize that, beyond this environmental sustainability challenge, aquaculture faces many other challenges, the most important ones being fish health, food safety, farm risk management, innovation, marketing and trade.

Aquaculture exists in a very competitive international environment and it is of paramount importance that Canadian aquaculturists are adequately equipped to compete on a level playing field. Canadian aquaculturists must be treated as farmers and food producers requiring agronomists, veterinarians, nutritionists and geneticists to understand their needs and support the development of their industry.

The new Agriculture Policy Framework (APF) announced by the Prime Minister in June of 2002 is aimed at rejuvenating both the federal and provincial policies and management of the agriculture sector, in order to help Canadian farmers face today's new challenges.

The APF is built upon five themes:

- Business risk management
- Food safety and food quality
- Science and innovation
- Environment
- Renewal

Each of these themes forms the basis for new or existing programming. In order to ensure that both levels of government are working towards these common goals, a new APF Agreement was negotiated between Canada and the provinces and territories during 2003. The Minister of Agriculture and Agri-food Canada is negotiating specific Implementation Agreements with each province and territory. One of the main objectives of the new APF is to help Canada increase its share of international markets. As a major food (including seafood) exporting country, increased international market shares should translate into increased wealth for Canada. Central to this objective is the notion of "branding Canada," that is, ensuring that all elements of our food production system are sustainable and capable of producing safe, wholesome food for our export markets.

The current needs of the aquaculture sector are closely aligned with the themes announced in the APF. Moreover, one can argue that some elements of the APF, e.g. food safety and branding of Canadian food in international markets, could be at risk if fish products are excluded from this initiative.

In summary, although the regulatory role of DFO is of paramount importance in securing public confidence in aquaculture and helping the industry earn its social

license, it is urgent that the federal government recognize the agriculture nature of aquaculture and establish a public policy and regulatory environment that distinguishes aquaculture from fisheries and that establishes the rights of aquaculturists to manage their private stocks according to agronomy principles and market forces instead of having to follow regulations aimed at controlling public fisheries. It is important to understand that provisions of the *Fisheries Act* to protect fish habitat and provisions of the *Canadian Environmental Assessment Act* would continue to apply to aquaculture in order to ensure that aquaculture operations are conducted in an environmentally safe manner.

The following three points are key to the identification of an appropriate policy response to the issue of confidence that is facing the federal government:

- The fact that 34 federal departments and agencies are involved either directly or indirectly in aquaculture clearly demonstrates the need to implement a horizontal approach to the management of aquaculture within the federal system.

- Aquaculture is also a shared jurisdiction in Canada and thus requires an effective and permanent federal/provincial/territorial planning, harmonization and management mechanism.

- Aquaculture products are food, and thus require a modern agriculture-based approach with regard to on-farm food safety, production management, farm risk management, quality assurance and marketing.

An Appropriate Federal Role in Aquaculture

As a private enterprise, it is industry's role to develop internationally competitive and commercially successful aquaculture ventures. However, government policies and programs shape the environment in which industry operates and thus can significantly influence the scope and pace of industry growth and competitiveness. With a view to generating wealth and employment opportunities for Canadians, governments act as a catalyst to create a business environment in which aquaculture can flourish, while simultaneously upholding mandated responsibilities to safeguard public health and navigational safety, and to protect the environment. Such a role is consistent with current federal policy as outlined in the Federal Aquaculture Development Strategy, the 2002 Speech from the Throne and other cabinet directives pertaining to the development of a strong and sustainable Canadian economy.

As a newer agri-food sector, however, sustainable aquaculture development is constrained by policies, regulations and legislation that were developed largely for fisheries management and which cannot effectively accommodate the nuances of aquaculture. Consequently, delineation of a more appropriate federal role in aquaculture is required.

For all economic sectors, the "enabling" role

of government necessitates striking an effective balance between regulation and development. From a regulatory perspective, the federal government is mandated to uphold human health and safety and environmental integrity. For example, the Canadian Food Inspection Agency (CFIA) must continue to provide assurances to consumers in domestic and export markets that Canadian fish and seafood is safe and wholesome. Similarly, Environment Canada and DFO must maintain public confidence in our capacity to ensure that activities are conducted in a manner that will not compromise the integrity of coastal and freshwater resources, and that the Coast Guard maintains public safety on our waterways. Should public confidence in the government's ability to effectively provide such safeguards erode, sustainable development will be compromized.

Moreover, the aquaculture sector itself is dependent upon these very safeguards. In the absence of healthy and productive aquatic ecosystems, aquaculture productivity and competitiveness are compromised. Without safe, navigable waterways, the security of aquaculture stocks is compromised. If consumers cannot be assured that products are safe and wholesome, markets are compromised. Hence, governments and aquaculturists are natural allies in the effort to develop and implement measures that enhance sustainability.

The responsibility for realizing aquaculture's considerable potential lies with industry, while the government is responsible for providing industry with an enabling policy and regulatory framework, supported by a modern administrative system in which expertise and capacity are adapted to the needs of the sector. By providing a balanced federal response to aquaculture, Canada benefits from a more effective and efficient public service for the regulation and development of the sector, enabling it to realize its potential as a sustainable supplier of farm-raised fish, shellfish and aquatic plants and as a revitalizing force for coastal and rural economies. Effective and efficient delivery of these complementary roles across a multitude of federal departments and agencies requires a coordinated and integrated federal response.

A Vision for Sustainable Aquaculture Development in Canada

During the summer of 2002, OCAD organized eleven regional workshops with industry, government and other stakeholders to solicit the perspectives of those groups that are most directly involved with aquaculture development in Canada. These collective views were compiled into a cohesive *Vision for Sustainable Aquaculture Development in Canada*.

Aquaculture is an environmentally sustainable food production sector that enhances the value and productivity of Canada's fish and seafood sector. By producing wholesome products that exceed consumer expectations for taste, quality and convenience in domestic and international markets and by applying prudent production practices, Canada's aquaculture industry continues to attract investment to sustain growth and diversification. Operating in an enabling policy and regulatory environment, the sector brings sustainable economic and social revitalization to coastal and rural communities in a manner that is respectful of Aboriginal rights and traditional ways of life. Recognizing the significant societal benefits of aquaculture development, the Government of Canada has made it a key federal priority. Canada will fulfill its potential as a competitive force in sustainable aquaculture development.

A vision without action is merely wishful thinking. The visioning exercise also clarified which elements were deemed to be fundamental to the successful development of the aquaculture sector in Canada. If acted upon, the eleven strategic elements identified will allow the vision to be achieved. Each element represents a high-level component of the vision that, ultimately, will require strategic focus for further implementation.

The elements identified are: Environmental Sustainability; Integrated Management; Policy, Legislation and Regulation; Aboriginal Peoples and Aquaculture Development; Research and Technology Exploitation; Finance, Industry Development and Infrastructure; Marketing and Trade; Food Safety; Aquatic Animal Health; Training and Education; and, Communications. Readers should refer to the Commissioner's public report entitled, *Achieving the Vision* for a full discussion of these elements.

Specific Recommendations

Based upon the results of the visioning exercise and an analysis of the potential for aquaculture in Canada based on a number of background studies, a set of specific recommendations has been developed that if followed, will go a long way to restoring Canada as an important aquaculture nation. These recommendations encompass three main themes or pillars:

- **Pillar One** — Environmental Standards, Regulatory Change and Reporting Mechanism
- **Pillar Two** – New Framework for Enhanced Federal/Provincial/Territorial Delivery of Aquaculture in Canada
- **Pillar Three** – Funding

Pillar One - Environmental Standards, Regulatory Change and Reporting Mechanism

Long-term legal access to sites of sufficient scale to enable industry to be internationally competitive is the single most important factor limiting future expansion of aquaculture in Canada. Shared governmental jurisdiction over aquaculture activities, together with a complex legal framework and the recent emergence of the sector as a commercial reality, has too often resulted in a site-application review process that is inefficient, unpredictable and costly for all parties involved. New approaches must be found that make the environmental assessment process more predictable without sacrificing its effectiveness.

By establishing, in law, acceptable standards for the environmental impacts of aquaculture, the federal government will achieve three important goals. First, it will provide clarity to farm operators as to how to conduct their businesses. This will remove the ever present threat of possible prosecution and contribute towards better collaboration between industry and regulators. Second, the standards will demonstrate to a concerned public that the federal government has listened to their concerns for better protection for the aquatic environment. Public concern has been a major preoccupation of the Auditor General and the Standing Committee on Fisheries and Oceans, among others. Third, it will increase the international competitiveness of Canada's aquaculture industry. All of Canada's competitors are faced with similar problems with respect to public concern over environmental protection. By "getting it right," Canada will be seen as a world leader in sustainable aquaculture production and this will translate into sales opportunities.

Adjustments of the provincial regulations to the *Fisheries Act* are also being recommended to ensure that there is consistency of application across the country. This is not the case at present.

This report also proposes the development of new tools to help DFO Habitat officers, as well as applicants, complete the environmental assessment process more efficiently.

Recommendation 1

It is recommended that the federal government establish regulations pursuant to S. 36 of the *Fisheries Act* to authorize the deposition of deleterious substances in relation to aquaculture operations under prescribed circumstances and protocols.

Recommendation 2

It is recommended that the federal government, recognizing the time frame associated with regulatory measures, establish interim guidelines for the deposition of deleterious substances utilized within the aquaculture sector, based on knowledge currently available in Canada and in other jurisdictions. Such guidelines could be implemented

via Standard Operating Practices (SOP) or Codes of Practice (COP), adherence to which would be a mandatory condition of securing a site lease, aquaculture license and/or federal authorization.

Under the present legal framework, the absence of scientific standards pertaining to the deposition of deleterious substances into fisheries waters leaves aquaculturists no choice but to operate within a vague and subjective system. Moreover, operating under such a cloud of uncertainty, they never know if their actions will result in a prosecution in the courts. This situation destabilizes investor confidence in the Canadian aquaculture sector.

In the absence of compliance limits based on prescribed circumstances and protocols, parties are free to establish their own views regarding acceptable limits, which has given rise to strongly opposing views and to the development of anti-aquaculture and anti-government campaigns. Scientifically derived standards would provide an effective means by which to evaluate and prosecute non-compliant actions. The lack of clear and transparent standards has negatively influenced public perceptions pertaining to aquaculture, increased tensions between aquaculturists and environmental groups, Aboriginal groups and citizens, and has created uncertainty, confusion and inconsistency among federal officials charged with administering the sector. Therefore, measures to establish compliance guidelines with respect to S. 36 of the *Fisheries Act* are essential to sustainable aquaculture development (and indeed, for all non-fisheries development throughout the entire coastal resource sector). Recommendations for interim measures are informed by practices in other countries where aquaculture is practised.

Recommendation 3

It is recommended that the federal government enact a regulation under S. 43 of the *Fisheries Act* which would give Habitat officers discretion to avoid having to consider whether a new or proposed aquaculture operation was likely to cause a harmful alteration, disruption or destruction (HADD) under S.s. 35(2) of the *Fisheries Act*. Such discretion would be limited to situations where the new or proposed aquaculture operation explicitly subscribed to an approved Code of Practice which, inter alia, addressed fish habitat concerns.

Interpretation and application of S. 35 with respect to aquaculture projects continues to present a significant constraint for aquaculture development. DFO's Habitat Management Policy expressly protects fish habitat, giving fishing activities precedence over other activities that also provide societal benefits, including aquaculture. Provisions for effectively balancing human values (environmental, social, economic) are required to promote the best use of aquatic resources and to ensure that non-fishery activities are not relegated to areas that have no capacity for fisheries production.

Aquaculture has become significant from the perspective of environmental assessment, requiring reviews for both new site development and for the expansion

and relocation of existing sites. Applying the federal Habitat Management Policy to aquaculture operations in a timely and consistent manner has proved difficult. Moreover, with the sector poised to expand in many parts of the country, the current challenge will only intensify unless immediate changes are made.

This recommendation will, in essence, allow Habitat officers to avoid having to formally make a determination of whether a HADD exists, thus eliminating the lengthy and costly acquisition of information. The public interest is protected by restricting the use of this discretion to situations where applicants are known to subscribe to approved Codes of Practice that specifically address habitat concerns, such as minimum distance of cages from salmon-bearing streams, etc.

Recommendation 4

It is recommended that the federal government establish an effective protocol to harmonize federal and provincial data and information collection requirements and procedures for conducting timely and efficient Environmental Assessments (EA). This process should include:

- **Development of a concise federal guide(s) describing information requirements for aquaculture initiatives that will enable the responsible authority to conduct an EA**
- **Identification of a clear decision-making process for EA's**
- **Development of a companion guide(s) intended to help aquaculture-site applicants prepare a screening report for submission to the responsible authority for decision**
- **Development of an internal manual to provide EA officers with guidelines for making consistent decisions across cases and regions, in keeping with the intent of *CEAA* and other regulatory instruments**
- **Development of class-type screenings for aquaculture under *CEAA* for both shellfish and finfish (marine and freshwater) operations**

Environmental assessment is an important planning and decision-making tool that comprises a significant portion of the review process. Through the organized gathering and review of information, the potential effects of proposed projects on the environment can be identified and understood. The consideration of such effects early in the planning stages of a project promotes better planning and can save time and money by proactively addressing potential issues before they become problems. Thus, CEAA encourages responsible authorities to take actions that promote sustainable development and thereby achieve or maintain a healthy environment and a healthy economy.

It is acknowledged that, if Recommendations 1, 2 and 3 are implemented, the scope of Recommendation 4 will be somewhat reduced.

Recommendation 5

It is recommended that, in view of the private property nature of aquaculture production, Fisheries and Oceans Canada amend the following regulations under the *Fisheries Act* with a view to excluding aquaculture from its application:

- **Maritime Provinces Fishery Regulations SOR/93-55 - S.s. 3(d) be amended as follows:**
  - **"(d) cultured or cultivated fish found in or taken from (i) an aquaculture area or site operated under a lease or license issued by the Minister or under the *Aquaculture Act* of Nova Scotia or the *Aquaculture Act* of New Brunswick, or (ii) a privately owned fish pond that does not contain any wild fish and to which wild fish have no access;"**
- **Atlantic Fishery Regulations SOR/86-21 -Paragraph 3 (e) be replaced as follows:**

  "3(e) taking fish from an aquaculture operation licensed by a province"

In order for aquaculture in Canada to achieve its potential, an effective legislative framework must be put in place. This will provide a certainty and predictability to the industry that will assist in attracting new investment. It will also lay out in law how the industry is to be developed.

At present, a series of provincial regulations, under the *Fisheries Act*, are used to regulate the fishery. Some of these regulations exempt aquaculture completely (e.g. Pacific Fishery Regulations), while others contain language that partially exempts aquaculture. For example, the Maritime Provinces Fishery Regulations, which, among other things, control fishing seasons, gear types etc., do not apply to aquaculture—except for oysters. This creates concern among oyster growers since they alone are subject to these regulations. Similarly, the Atlantic Fishery Regulations exempt only Atlantic salmon from the regulations.

The existence of uniform set of provincial or regional fisheries regulations exempting aquaculture would benefit the aquaculture sector. Although the Maritime Provinces Fishery Regulations and the Atlantic Fishery Regulations are the focus of this recommendation since they appear to create confusion as to whether all aquaculture or merely some aquaculture is to be exempted, other provincial regulations may need to be assessed to determine if similar clarification is required**.**

Recommendation 6

It is recommended that greater aquaculture sector involvement in growing water sanitary monitoring for classification purposes be allowed under the Canadian Shellfish Sanitation Program (CSSP). Memoranda of Understanding (MOU) between leaseholders and the relevant federal regulatory agencies, similar to the one currently being used for the management of conditional approved areas, would be signed. These MOU agreements would specify the respective

roles and responsibilities of the leaseholder and the regulatory agencies. The MOU's would deal specifically with the harvesting of molluscan shellfish from aquaculture leases, allowing growing area classification and micromanagement at the lease level.

Historically, the shellfish growing water classification program of the CSSP has been conducted by Environment Canada. Due to resource constraints, the department has been unable to keep up with the demand from shellfish growers for new growing water classifications. The involvement of farmers in a growing water monitoring program was considered a potential option for the CSSP regulators and the aquaculture sector in order to maintain and possibly improve the services.

The federal government is currently pursuing an agenda of smart regulation to foster innovation, economic growth and industry competitiveness (Throne Speech, 2002). Water farmers need fair, cost effective and open regulations that will meet public policy objectives. Canada should look at "best regulation" practices of other jurisdictions which are designed to improve aquatic product safety. New Zealand, Maine and California are already moving in the direction of smart regulation in the sanitary management of shellfish growing waters. Third party sampling is now accepted and monitoring agreements with the competent authorities have been developed. Shellfish farmers are allowed to fulfil this role.

It is in the shellfish farmer's best interest to provide safe, quality products for their clients. The CSSP should allow shellfish farmers to be involved in routine sampling on their lease(s) for plankton, biotoxins, fecal coliforms and other hazardous and deleterious substances. The sampling would be performed in a manner and at a frequency prescribed by Environment Canada/CFIA under the CSSP. This approach offers a solution that reinforces and rewards an approach based on simple processes, economic efficiencies and appropriate accountability checks.

Pillar Two – New Framework for Enhanced Federal/Provincial/ Territorial Delivery of Aquaculture in Canada

Aquaculture in Canada is a shared responsibility. Provinces have the power to license and regulate the operations of aquaculture companies and to lease provincial lands to aquaculturists. The federal government is responsible for management of the fishery, conservation of wild stocks, protection of the marine environment, the regulation of shipping and the use of navigable waters. As well, in federal waters, the federal government is responsible for regulating access to these waters, including access by aquaculturalists.

Up to now, federal/provincial/territorial coordination has largely been achieved through a series of MOU's negotiated during the 1980's between the Minister of Fisheries and Oceans and the respective provincial fisheries Ministers. As these agreements are between fisheries ministries, naturally they cover fisheries-related topics. They do not cover issues that lie outside the mandate of the fisheries departments. Given the importance of issues other than fishing to the success of aquaculture, the present arrangement seems ill suited to meeting the objectives that governments have set for aquaculture development. Many provinces have organized their fisheries and farming sectors into a single department of agriculture, fisheries and food or some variant, in recognition of the need to group all food production activities together.

Recommendation 7

It is recommended that the federal government negotiate a new Aquaculture Framework Agreement supplemented by individual Implementation Agreements with the provinces and territories to:

- **Coordinate policy objectives for aquaculture development and regulation;**
- **delineate respective roles and responsibilities;**
- **streamline administrative processes and, where appropriate, establish single-window application procedures;**
- **establish service standards;**
- **prescribe consultative mechanisms, including appeals processes and procedures for conflict resolution, and;**
- **identify cost-shared programs and services, where appropriate.**

Given the significant and determining role that governments in Canada play in aquaculture, a renewed approach to federal/provincial/territorial relations is necessary to fully exploit available opportunities. Although considerable progress has been made by the federal, provincial and territorial governments to address challenges and constraints to sustainable aquaculture development,

efforts must be intensified. In this regard, the federal government must redouble its efforts to create true partnerships with provincial and territorial governments.

This new structure—a national Aquaculture Framework Agreement supplemented by bilateral Implementation Agreements–would recognize that aquaculture is a federal priority, reflecting the relevant interests of all federal departments and agencies. It would allow provinces and territories to aggressively pursue aquaculture development where the desire exists. To enhance public accountability and bolster investor confidence, the Aquaculture Framework Agreement and the ancillary Implementation Agreements should be reinforced with realistic service standards, wherever possible. In addition, the need for a strategic, integrated federal/provincial/territorial approach, supported by *national strategies* in several critical areas, has been identified as essential to the sustainable development of aquaculture in Canada. Consequently, priority should be placed on development of national strategies for research, development, infrastructure and Aboriginal aquaculture. A national framework agreement, supported by a series of bilateral agreements similar to those introduced in Agriculture and Agri-Food Canada's (AAFC's) Agriculture Policy Framework, is envisaged.

Specific issues requiring policy coordination and cooperative implementation include, but are not limited to:

Site Access and Integrated Management

- Establish a planned, balanced and inclusive community approach to rural economic and social development for the benefit of Canadians. Targeted funding for this initiative is outlined in Recommendation 8.

- Establish a standardized, "single-window" aquaculture site application and review process in each province and territory.

Environmental Assessment and Monitoring

- Develop industry-led and government-approved Environmental Codes of Practice that incorporate science-based standards and principles of adaptive risk management and which are supported by transparency and accountability in monitoring, reporting and enforcement.

- Develop a harmonized approach for *Navigable Waters Protection Act* permitting (refer to Recommendation 4).

- Establish class-type environmental screenings under the *Canadian Environmental Assessment Act*.

- Establish science-based compliance standards to support environmental legislation/regulations.

Food Safety

- Develop national food safety standards, which are equivalent to international standards developed for our predominant markets, in a harmonized approach with provincial, territorial and appropriate international jurisdictions.

- Develop farm-based Hazard Analysis and Critical Control Points (HACCP) food safety systems.

- Establish mechanisms to enable product traceability from farm to market.

Research

- Establish a coordinated and collaborative framework to emphasize research in support of present and future productivity within the aquaculture sector and to produce continuous improvement in the development of environmentally sustainable technologies.

- Develop a national strategy and action plan for aquaculture research.

Aquatic Animal Health

- Implement the National Aquatic Animal Health Program.*

Marketing and Trade

- Maintain and promote security of access to international trade routes in support of this export-oriented industry.

- Take proactive measures to mitigate tariff and non-tariff trade restrictions.

- Develop a "Canada Brand" initiative for fish and seafood.

Farm Risk Management, Industry Development and Infrastructure

- Develop and implement an aquaculture stock insurance program that provides coverage for extraordinary losses due to natural perils.

- Create a national aquaculture development strategy on a cost-shared basis with the provinces/territories and industry to establish programs and services in support of sustainable aquaculture development.

- Develop a national aquaculture infrastructure strategy on a cost-shared basis with the provinces/territories to support aquaculture investment and development.

Aboriginal Aquaculture Development

- Develop a national strategy for Aboriginal aquaculture development with input from the provinces/territories[13].

Recommendation 8

It is recommended that the federal government establish a special fund to

[13] Although First Nations are a federal responsibility, many provinces are implicated in Aboriginal development initiatives through site access, commerce, property rights, etc.

* Implementation of NAAHP will require a new MC to report on negotiations, to present the program and to secure funding.

provide financial resources for development and implementation of integrated management pilot projects in areas where aquaculture is prevalent. The aim of these pilot projects is to develop tools to reduce or eliminate conflict, including establishing aquaculture-suitable zones or aquaculture-free zones, bay management projects, or other coastal land use planning initiatives.

There is an urgent need to develop a more proactive aquaculture planning and siting process. The present "case-by-case" approach is costly and inefficient for all parties, including the government. Moreover, adoption of a more proactively planned and integrated approach that builds on best practices is consistent with the planning approach advanced in the *Oceans Act* and the *Canadian Environmental Assessment Act*. The absence of such a strategic approach to date has resulted in conflict, unsustainable resource management practices and lost economic opportunities.

A planned and inclusive community approach to resource management and coastal planning, including effective mechanisms for conflict resolution, is required to effectively balance social and economic sustainability, ecosystem integrity and human values.

Through the establishment of a special fund dedicated to developing planning and dispute avoidance tools, much of the negativity surrounding aquaculture siting could be reduced.

Pillar Three—Funding

Recommendation 9

It is recommended that the federal government provide new funding to support the continued growth of the aquaculture sector.

It will be important for the federal government to extend its policies and programs beyond its current fisheries focus into an agri-food focus. Not only will this help the sector to grow, but it will also round out the promise contained in the Agriculture Policy Framework for a Canada-wide system of safe and wholesome food production.

To achieve this goal will take new funding. Funding both to strengthen our regulatory system and to put in place badly needed agriculture-type programs. By making such an investment, the federal government will help protect the vitality of coastal and rural communities strengthen and possibly regain its position in the world as a top seafood exporter and reinforce the message that buying Canadian fish and seafood is buying quality.

Organizational Scenarios

Government must consider whether or not the current organizational structure for aquaculture is up to the tasks of delivering the improvements contained in the nine recommendations and providing the necessary federal leadership.

There have been many new challenges facing the aquaculture industry as it attempts to compete in the global food production system. Many of these challenges have arisen from the changing role DFO has undergone as its core objectives have evolved towards marine protection and conservation. A number of other challenges have arisen due to the nature of the sector and its needs. It is a farming activity, with farming programming, policy and regulatory requirements.

There are now as many as 34 federal departments and agencies with either an identifiable role or the capabilities to support the continued sustainable development of aquaculture. Therefore strong horizontal management is required.

Other nations are aligning their organizational structures to better suit the nature and needs of the sector and to enable more effective governance. Canada should too.

The Commissioner believes the following three scenarios represent an improvement over current arrangements and should be assessed.

Scenario 1: Agriculture and Agri-Food Canada is Given Responsibility for Aquaculture Development

Under this organizational scenario, AAFC would be given responsibility for Aquaculture development. AAFC would regard aquaculture operators as farmers and provide the same type of policy and program support to fish farmers as to terrestrial farmers through their APF. AAFC would be responsible for the horizontal management of federal aquaculture initiatives and for management of industry/stakeholder/government interactions.

AAFC would also be responsible for vertical management of federal/provincial/territorial initiatives. The foundation and framework for the vertical management would be attained through the signing of a Canadian Aquaculture Framework Agreement with the provinces/territories and by Implementation Agreements negotiated with each of the provinces/territories.

The current lead agency for aquaculture, DFO, would maintain its regulatory responsibilities for the protection of wild fish stocks and fish habitat. DFO would involve itself in the regulation of aquaculture where aquaculture had an impact on DFO's core legislative responsibilities for wild fish stocks and fish habitat. DFO would not be directly involved in aquaculture development activities; rather, the department would provide support to Agriculture Canada's development efforts by means of a regulatory and policy framework that is conducive to sustainable growth and development of the sector.

Considerations:

The aquaculture industry cannot continue to be treated as a subset of the fishery. Aquaculture is a farming—not fishing—industry.

It has become clear that successful aquaculture development in Canada, as in other countries, requires an agri-food policy and programming approach that responds to the developmental needs of the sector. Agriculture Canada, with the addition of some further aquaculture-specific expertise, has the capability of providing this key agri-food support. Of the three scenarios identified, this is the one that is most likely to open up the broadest array of AAFC's policy and program support. Moreover, it is probably the option that would bring in that necessary agri-food support in the most administratively cost effective manner.

The aquaculture client group would be quite receptive to such a change. On a number of occasions, representatives of the industry have expressed a desire for more of an agricultural policy approach to the sector, as well as a transfer of lead agency responsibilities to AAFC. Moreover, a portion of Agriculture Canada's core client group is already involved with aquaculture and there are many more who are considering diversifying into aquaculture.

A number of provinces (e.g. British Columbia, Ontario, Quebec) have already made an adjustment to accommodate the agri-food aspects of aquaculture through organizational change.

If AAFC was given responsibility for aquaculture development, DFO would be able to focus more on conservation, protection and economic management of the fisheries. A transfer would also serve to reduce the real and perceived conflicts between DFO's regulatory responsibilities related to conserving the wild fish resource, and its being the lead for aquaculture development.

Transferring responsibility for aquaculture over to AAFC would not be without its challenges. However, those challenges can be readily addressed. First, Agriculture Canada would need enhanced levels of expertise on aquaculture in a number of areas, including fish biology. In addition, to maximize efficiency of program support for aquaculture and delivery of the lead agency role, some program elements such as aquaculture R&D from DFO, would likely need to be transferred from other agencies. However, both the enhancement of aquaculture-specific expertise and program transfers should be accomplished without too much difficulty. There is expertise that could be transferred from OCAD and from DFO's Aquaculture Science Directorate and Office of Sustainable Aquaculture which would meet most, if not all, of AAFC's immediate requirements for additional aquaculture expertise.

Second, there are already existing MOUs and co-operative arrangements between DFO and the designated lead provincial/territorial agencies in place for provinces and territories. However, as is noted in Recommendation 7 of this report, a renewed approach to federal/provincial/territorial relations is necessary to fully exploit Canada's opportunities for aquaculture development. More effective federal/provincial/territorial partnerships to address the constraints to development are required. The approach that appears to offer the most opportunity for meeting the needs in this area (and which is discussed in Recommendation 7) is to develop a Canadian Aquaculture Framework Agreement together with a series of provincial/territorial framework agreements. This approach is in fact modelled on what AAFC is already doing for agriculture and it has the experience in negotiating and operating under such federal/provincial/territorial cooperative frameworks. Moreover, access to much of the APF program support that is required by aquaculturists is governed and/or covered by the Agriculture Framework Agreement and the provincial/territorial Implementation Agreements.

Scenario 2: An Aquaculture Agency is Established

An Aquaculture agency could be established that would be responsible for Aquaculture development. Such an agency could report to the Minister of Fisheries and Oceans or to the Minister of Agriculture and Agri-Food. The agency would provide direct program support to the sector itself, such as the Aquaculture Collaborative Research and Development Program (ACRDP), and also research support, but would not be involved in regulation.

The agency would be responsible for horizontal management of federal aquaculture initiatives and for management of the industry/stakeholder/government interactions. The agency would also be responsible for vertical management of

federal/provincial/territorial initiatives.

As with scenario 1 (transfer of responsibility for aquaculture development to AAFC), the current lead agency for aquaculture, DFO, would maintain its regulatory responsibilities for the protection of wild fish stocks and fish habitat. DFO would involve itself in the regulation of aquaculture where aquaculture had an impact on DFO's core legislative responsibilities for wild fish stocks and fish habitat. DFO would not be directly involved in aquaculture development activities; rather the department would provide support to the agency's development efforts by having a regulatory and policy framework that is conducive to sustainable growth and development of the sector.

As well, all other federal government agencies would maintain their current regulatory roles and responsibilities.

The core staffing of such an agency could largely be drawn from OCAD and from DFO's Aquaculture Science Directorate and Office of Sustainable Aquaculture.

Considerations:

The establishment of an Aquaculture agency would have the particular advantage of sending a clear message to the aquaculture client group that aquaculture development is viewed by the federal government as being important, and the needs of the sector will be given specific attention by an agency that is established to focus on it. The establishment of such an agency would likely receive strong support from the aquaculture client group.

The establishment of an agency would also confirm the acknowledgement by the federal government that Canadian aquaculture's potential is substantial and that Canada does not want to be left behind by competing countries. Rather, it wants to be a world leader in sustainable aquaculture for the decades to come.

Similar to a transfer of aquaculture development responsibilities to AAFC, the establishment of an agency would enable DFO to focus more on conservation, protection and economic management of the fisheries. The establishment of such an agency—particularly if it reported to the Minister of Agriculture and Agri-food—would serve to eliminate the issue of whether there was any validity to concerns that have been raised about whether there is an inherent conflict between DFO's regulatory responsibilities related to sustaining the wild fish resource and its being the lead for aquaculture development. As such, it would contribute significantly to reducing, if not eliminating, the criticism of DFO that it is in a conflict of interest with respect to its support of aquaculture development.

The establishment of an agency would also enable the consolidation and integration of program support within the agency in critical areas such as research.

There are some potential challenges to pursuing this option. In particular, the establishment of an agency does not eliminate the need for AAFC to be significantly involved in the file to obtain the agri-food type of support that the aquaculture sector will need for its continued development. In fact, much of the development-oriented support and agri-

food expertise that is needed to guide the sector's development would still need to be drawn from AAFC unless a number of the programs and capabilities of AAFC were replicated by the agency. For example, the APF programs that would benefit industry development would still need to be accessed through AAFC, unless an agency was to create and secure funding for APF-like, but aquaculture-specific, programs itself.

Scenario 3: DFO Continues as Lead Agency, but Agriculture and Agri- Food Canada's APF is opened to Aquaculture

This scenario would be the organizational status quo (for the federal government) with the exception that AAFC would open up the programs that are relevant and applicable to aquaculture. Agriculture Canada would be involved with the aquaculture file in relation to its administration of the specific programs opened up and to the extent that aquaculture is addressed within AAFC's Canada Food Branding initiative and its National Seafood Roundtable.

However, it would involve DFO fully engaging as a lead agency to support the continued growth, development and environmental sustainability of the sector.

Aquaculture is a difficult policy and management challenge, involving multiple government agencies at the federal, provincial/territorial and municipal levels. Moreover, the rapidly growing and evolving nature of the sector, the range of species cultured and the diverse regional differences in activities intensify the degree of complexity. Such a file necessitates effective leadership in three fundamental areas:

- **Horizontal management of federal initiatives**
- **Vertical management of federal/ provincial/territorial initiatives**
- **Management of industry-stakeholder-government interactions**

Effective management of aquaculture is also predicated upon an open and transparent dialogue between and amongst all stakeholders, including industry, governments, academe, other user groups and the public at large. By providing a focal point for communications pertaining to aquaculture, the federal lead agency can establish a reliable conduit to facilitate effective dissemination of objective information about aquaculture.

The *Federal Aquaculture Development Strategy*, which was approved by Cabinet in 1994, calls for the federal lead agency to "encourage the development of a federal policy, program and regulatory environment that is complementary to industry and provincial / territorial activities" and to "coordinate the aquaculture-related activities of all federal departments in order to maximize efficiency and minimize duplication." The strategy specifically identifies the lead agency role to be as follows:

1. Coordination

- **Chair federal inter-agency meetings**

to enhance communication and cooperation among federal departments and agencies.

- **Harmonize Canada's work in aquaculture with international standards and protocols, particularly with regard to product safety and inspection.**

2. **Policy**

- **Coordinate federal policy on issues pertinent to aquaculture.**

- **Promote the development of a harmonized federal regulatory framework.**

3. **Advocacy**

- **Advocate the sustainable development of aquaculture in Canada.**

- **Promote industry interests and perspectives to other federal departments and agencies.**

4. **Liaison**

- **Promote increased dialogue and communication between all stakeholders.**

Also recognized in the strategy was the need for a close, ongoing working relationship with the provinces and territories, which was also implicit as part of the federal lead role.

Considerations:

This option would have the advantage that no potentially disruptive organizational changes would be required on the part of the federal government to implement the plan. However, DFO would have to make adjustments to orientations, priorities, resourcing and staffing to effectively play the lead agency role required for continued development of the industry and effective governance of the sector.

Opening up the relevant and applicable APF programs to aquaculturists would grant aquaculturists the eligibility to benefit from these programs. However, there could be significant administrative challenges to making such an arrangement work effectively.

Moreover, this option is not likely going to result in as extensive support from AAFC, as required. This scenario is also likely to require a referral to Cabinet for decision because of its broader governmental implications.

There is also considerable doubt that AAFC would undertake the considerable administrative effort necessary to open up the APF programs at all, if it was not made responsible for aquaculture development. There would seem to be little incentive for it to do so.

This approach would not likely contribute to a reduction in the criticism that the government is receiving about an inherent conflict between DFO's regulatory

responsibilities related to sustaining the wild fish resource and being the lead for aquaculture development. Nor will this option enable DFO to refocus its efforts on wild fisheries issues and problems that are at the very core of its mandated responsibilities. These are considered to be some of the most serious negative implications of this option.

And finally, this option is the least likely to find favour with the aquaculture client group.

Conclusion

Photo: Kim Stallknecht

Aquaculture is one of the few development opportunities that depends upon remote communities to be realized. This unique characteristic represents an incredible opportunity to rejuvenate economic activity for many rural and coastal communities currently facing high levels of unemployment and population exodus.

Aquaculture is here to stay and will constitute a major food industry for many decades to come. If Canada wants to reap significant socio-economic benefits and be a world leader, not only in terms of a diversified production but also in terms of environmentally sustainable technologies and practices, it is essential to initiate a strategic change in the way we do business in the future.

The federal government must play both its regulatory and developmental roles if Canadian aquaculture is to achieve its potential. To do this effectively will require a change to the current fisheries-dominated policy approach in favour of an approach that recognizes the agri-food nature of aquaculture. A new federal/provincial/territorial arrangement is required to ensure that all government departments and agencies will have an opportunity to contribute to the growth of the aquaculture sector.

Taken together, the recommendations suggested in this report would, if implemented, demonstrate leadership and commitment on the part of the federal government. The transition to a new regime will not be easy but it will be worthwhile.

New economic opportunities in Canada's rural, Aboriginal and coastal communities will be the result of this concerted effort. A better future for these Canadians is within our grasp—if we are bold enough to act.

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Appendix I:

TABLE 1 - Summary of Environmental Risks of Salmon Farming

Main conclusions regarding risk		
Salmon Aquaculture Review British Columbia Environmental Assessment Office (1997)	**The Net-pen Salmon Farming Industry in the Pacific Northwest NOAA Technical Memorandum (2001)**	**Making Sense of the Salmon Aquaculture Debate Pacific Fisheries Resource Conservation Council (2003)**
• Salmon Farming in BC, as presently practised and at current levels, presents a low overall risk to the environment. • However, concerns need to be addressed by more research and monitoring about: ✓ localized impacts on benthic organism, shellfish populations and marine mammals; ✓ significant gaps in the scientific knowledge in areas such as the potential impacts of interactions of escaped farmed salmon with wild population, identification and control of disease and disease pathogens, potential for disease transfer and impacts from antobiotic residues, and effects of waste discharge on water quality and seabed life. • Adaptive management approach should be taken to the sustainable development of the salmon aquaculture industry.	• Aquaculture is not a unique industry with unique hazards i.e. its systems and practices, and its products parallel those of many others industries and human activities. • Based on the evidence available in the existing literature and in ongoing research, degrees of risk vary considerably from issue to issue. • **Issues which carry the most risk in the Pacific Northwest Industry (localized):** 1. Impact of bio-deposits beneath net-pens 2. Impacts on benthic communities by the accumulation of heavy metals in the sediments below net-pens 3. Impact on non-target organisms by the use of therapeuthic compounds at net-pen farms • **Issues which carry a low risk:** 4. Physiological effect of low dissolved-oxygen levels on other biota in the water column 5. Toxic effect of hydrogen sulphide and ammonia from the bio-deposits below a net-pen farm on other biota in the water column 6. Toxic effect of algal blooms enhanced by the dissolved inorganic wastes in the water column around net-pen farms 7. Changes in epifaunal community caused by the accumulation of organic wastes sediments below net-pen farms 8. Proliferation of human pathogens in the aquatic environment 9. Proliferation of fish and shellfish pathogens in the aquatic environment 10. Increased incidences of disease among wild fish 11. Displacement of wild salmon in the marketplace by farmed salmonids • **Issuses which carry very little or no risk:** 12. Escape of Atlantic salmon– a non-native species 13. Impact of antibiotic resistant bacteria on native salmonids 14. Impacts on human health and safety	• Report's three main areas of investigation are disease and fish health and escapes and habitat impact. **1. Risks posed by disease issues:** • Sea lice are the most serious, immediate risk out of the three fish health issues considered in this report (parasites, bacteria and viruses). • Antibiotic resistance caused by the use of antibiotics on salmon farms does not appear to create risks to wild salmon. • Bacteria pose the lowest risk to wild salmon, among the three fish health issues considered i.e. level of risk posed to wild salmon by viruses of farm origin is intermediate to the higher risk from sea lice and the lower risk from bacteria. **2. Risks posed by escapes:** • Observations to date show that colonization by Atlantic salmon in BC waters is unlikely, though not impossible. • Generally, farmed Atlantic salmon survive poorly in the wild. • Escaped Atlantic salmon have reached BC rivers and spawned there. • The small presence of juvenile feral Atlantic salmon in BC streams does not prove that colonization is taking place. However, this data, combined with the observations of spawning Atlantic salmon, does suggest that colonization may occur. • The greatest risk of long-term effects of escapes would be Pacific farmed salmon escapes affecting wild pacific species via genetic, ecological and disease impacts. At present, such a risk for Atlantic and Pacific salmons exists in theory but there is little evidence of its occurence. • There are some occurences of disease transfer, although infrequent, and given the ratio of escaped to wild fish, the long-term risk is low. • Long-term genetic risks to wild Pacific salmon due to escaped Atlantic salmon are virtually zero. **3. Risks posed by habitat impacts:** • Habitat impacts, whether related to the seabed or to water quality, pose the lowest risk to wild salmon relative to escape-related or disease impacts.

Notes:

Photo : BCSFA