

**PACIFIC REGION**

**INTEGRATED  
MANAGEMENT OF  
AQUACULTURE  
PLAN**

**MARINE FINFISH**

*INTERIM*

**October 21, 2011**

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## Forward

The purpose of the Integrated Management of Aquaculture Plan for marine finfish (IMAP-MF) is to provide an overview of marine finfish aquaculture in British Columbia (both in terms of activities and governance); to identify management objectives, reporting and compliance; and to plan for the future management of the marine finfish aquaculture industry.

The IMAP-MF serves to communicate basic information about marine finfish culture and its management to Fisheries and Oceans Canada staff, industry, First Nations, stakeholders, and the Canadian public. The IMAP-MF provides an overview of the basic rules and mechanisms for the sustainable management of marine finfish aquaculture at the present time, and outlines how governments, First Nations, industry and stakeholders will work together to foster and support industry while protecting the environment and upholding and the obligations of government.

The IMAP-MF is not a legally binding instrument which can form the basis of a legal challenge. The IMAP-MF can be modified at any time and does not fetter the Minister of Fisheries and Oceans' discretionary powers as set out in the *Fisheries Act* or the *Pacific Aquaculture Regulations*. The Minister can, for reasons of conservation or for any other valid reasons, at any time modify any provision of the IMAP-MF in accordance with the powers granted pursuant to the *Fisheries Act* and supporting regulations.

Where DFO is responsible for implementing obligations under treaties or land claims agreements, the IMAP-MF will be implemented in a manner consistent with these obligations. In the event that an IMAP-MF is inconsistent with obligations under land claims agreements, the provisions of the land claims agreements will prevail to the extent of the inconsistency.

## 1. Introduction

British Columbia (B.C.) is currently the only jurisdiction in Canada where the federal government has taken on the lead responsibility for the licencing and management of aquaculture. In 2010 the federal *Pacific Aquaculture Regulations* were introduced, which now govern the conduct of aquaculture activities in B.C. Due to the complex jurisdictional framework for aquaculture both federal and provincial governments continue to share aquaculture-related responsibilities including tenuring, environmental protection, respect and recognition of First Nations rights, and planning. Although the federal government has taken on the lead role in aquaculture management, the provincial government still has a considerable role to play.

For purposes of management and licencing, Fisheries and Oceans Canada has divided the area of aquaculture into three main categories including: marine finfish, shellfish, and freshwater. In addition, salmonid enhancement and science/research are being dealt with through different processes.

Integrated Management of Aquaculture Plans are one part of the management framework for aquaculture in the Pacific Region. National policies/management approaches and individual Conditions of Licence (which are the rules and limitations outlined in the licences issued for aquaculture) work with IMAPs in order to structure the management of Pacific aquaculture.

The process of developing IMAPs is expected to take place throughout 2011 and 2012, with further evolution of IMAPs (and associated advisory processes, plans and management actions) taking place into the future. DFO will continue to work collaboratively with industry, First Nations, and stakeholder groups to help further develop IMAPs over time.

The IMAP for marine finfish aquaculture (the IMAP-MF) is concerned with the culture of any marine fish, with the exception of shellfish and aquatic plants, grown in part or in whole in salt water. The IMAP-MF does not include species expressly managed under either the Integrated Management of Aquaculture Plans for Shellfish (IMAP-SF) or Freshwater Fish (IMAP-FF). For greater clarity, sea cucumbers and urchins will be managed under the IMAP-SF, and land-based sturgeon or tilapia aquaculture will be managed under the IMAP-FF.

Culture implies human intervention in the rearing process to enhance production, such as regular stocking, feeding, and protection from predators. Culture also implies individual or corporate ownership, control, and responsibility for the stock being cultivated. In the case of marine finfish aquaculture, in B.C. the output of the process is fish for sale for human consumption at the end of the production cycle.

Planning through the IMAP-MF includes consideration of any part of the life cycle of cultured salmon or other marine finfish. It includes marine-based netcages, the use of hatcheries, closed containment and/or land-based farming of marine finfish, and polyculture (where marine finfish are a part of a polyculture environment).

The IMAP-MF does not consider salmonid enhancement or any form of ocean ranching. As opposed to enhancement or ocean ranching, in marine finfish aquaculture fish in the control of an aquaculturalist are considered the property and responsibility of the aquaculturalist from the time they are acquired (or bred) until they are harvested.

The IMAP-MF follows national direction provided by Fisheries and Oceans Canada within Aquaculture Management: *A Sustainable Aquaculture Fisheries Framework* (SAFF),<sup>1</sup> the *Fisheries (General) Regulations*<sup>2</sup>, and the *Pacific Aquaculture Regulations*.<sup>3</sup> Fisheries and Oceans Canada intends to merge the SAFF over time to align with the broader national *Sustainable Fisheries Framework*, and to integrate the management approach for aquaculture more fully with other fisheries management in developing ecosystem approaches.

The IMAP-MF sets out the following:

- sector overview and context;
- policy framework;
- science;
- economic, social, and cultural importance;
- management issues;
- general objectives & measures;
- ecosystem-based management measures;
- stewardship arrangements and engagement;
- reporting, compliance, inspection, and enforcement; and
- performance review.

DFO will work collaboratively with First Nations, industry, other governments and stakeholders to develop the IMAP-MF and the associated management framework for marine finfish aquaculture. The IMAP-MF will reflect an ecosystem approach, adaptive and area-based management components, and will incorporate the ongoing engagement of First Nations, industry, and stakeholders.

A companion document, the interim *IMAP-MF Backgrounder*, has also been developed to provide additional background information relating to the regulation and management of marine finfish aquaculture.

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<sup>1</sup> Insert link to the Sustainable Aquaculture Fisheries Framework.

<sup>2</sup> Insert link to fisheries general regulations

<sup>3</sup> The *Pacific Aquaculture Regulations* are available online at: <http://canadagazette.gc.ca/rp-pr/p2/2010/2010-12-08/html/sor-dors270-eng.html>

Further contact information related to marine finfish aquaculture is available in Appendix A of this document.

## 2. Sector Overview and Context

In December 2010, the department of Fisheries and Oceans Canada (DFO) assumed management responsibility for aquaculture from the province of B.C. In 2010 DFO issued licences for 123 marine finfish aquaculture facilities with a total combined allowable peak biomass of 281,579 tonnes (this is the total cumulative maximum tonnage in all licences issued, and is greater than annual production for the industry). The total annual production for marine finfish aquaculture in British Columbia is about 80,000 metric tonnes.

A number of land-based facilities are licenced under Freshwater Aquaculture licences for closed containment grow-out, and freshwater closed containment/ lake or pond freshwater grow-out. There are also a number of hatcheries licenced under freshwater aquaculture licences which process broodstock and incubate/hatch eggs for salmon, trout, and black cod for the marine finfish aquaculture sector.

### ***Cultured marine finfish species and types of culture***

#### **Cultured species**

At present the marine finfish aquaculture industry in British Columbia is dominated by the culture of salmon, with Atlantic salmon (*Salmo salar*) being the most popular type of farmed salmon. A number of other species are being cultured on a smaller scale and/or are in a testing and development phase by aquaculturalists and research institutions.

Atlantic salmon are a preferred species for marine finfish culture around the world, and they make up the vast majority of fish currently being farmed in British Columbia. They are suited to aquaculture because they: are domesticated to feed well on pellets, have a good feed conversion ratio, grow quickly, are less susceptible to disease in a farm environment than other species, adapt well to the confines of a net pen, and produce a product valuable to domestic and international markets.

Atlantic salmon are not native to the British Columbia coast. Over the past 100 years there were numerous unsuccessful attempts to introduce Atlantic salmon into the wild within B.C., but none of these efforts were successful.

In addition to Atlantic salmon, there are other marine finfish being actively cultured in British Columbia. These species are all indigenous to the Pacific Coast of Canada, and include:

- Chinook salmon (*Oncorhynchus tshawytscha*), also known as 'King' or 'Tye' salmon;
  - Coho salmon (*Oncorhynchus kisutch*);
  - Steelhead (anadromous) or Rainbow (landlocked) trout (*Oncorhynchus mykiss*);
- and

- Black Cod (*Anoplopoma fimbria*) also known as Sablefish or Butterfish.

More experimental-scale aquaculture is taking place on the following species:

- Pacific Halibut (*Hippoglossus stenolepis*)
- Wolf Eel (*Anarrhichthys ocellatus*)
- Ling cod (*Ophiodon elongatus*)
- Copper rockfish (*Sebastes caurinus*)
- Brown rockfish (*Sebastes auriculatus*)

In addition applications have been made for the culture of:

- Pilchard or Pacific Sardine (*Sardinops sagax*)

## **Types**

There are a number of types of culture which may take place in British Columbia, including: hatcheries; land-based, lake-based, marine-based, or offshore-based grow-out; and various types of closed containment.

### ***Land-based***

Marine finfish aquaculture can take place in a variety of locations. Closed containment and recirculation systems can be located on land and can use either freshwater or saltwater. Hatchery operations may also be located on land. In some cases experimental multi-trophic aquaculture may also be located in land-based tanks. Land may either be privately owned or may be tenured from the provincial government.

### ***Lake-based***

In some cases grow-out of anadromous fish prior to smolt stages may take place in lake-based netpens. Provincial tenures are usually required for these operations. At present there are no licenced lake-based facilities which would be providing fish that would be transferred into the marine environment as adults, but this may change from year to year.

### ***Marine Netpen***

Growout of fish to marketable sizes predominantly takes place in British Columbia in ocean netpens. Farms have both below and above water components. In the example of salmon, the number of fish grown at an aquaculture facility during a typical production cycle ranges from 200,000 to 1,000,000. A typical farm consists of approximately 12 to 16 square cages which are surrounded by aluminum walkways. Circle cages, sometime known as 'polar circles,' are also used in some locations. Nets may be individually anchored or may be attached to the walkways, with the entire assembly held in place by a series of anchors and lines which radiate out from the infrastructure. Netting must adhere to required strength testing, and will have mesh sizes that vary depending upon the size of fish being reared at a facility. Predator netting is often attached around the nets to discourage marine mammals from trying to gain access to the fish on site.

Normally a facility will have associated infrastructure including: an office, a fish health lab, a generator shed, food and mortality storage areas, floats, docks, and usually staff accommodation. Many of the marine finfish aquaculture licences are located in remote areas along the central B.C. coast and around Northern and Western Vancouver Island.

### ***Off-Shore***

In some parts of the world aquaculture is now taking place in large net cages moored in off-shore locations. These nets can either resemble the facilities used near-shore in B.C., or can consist of submerged nets which are moored below the surface. At the present time there are no off-shore aquaculture facilities in B.C.'s Pacific waters and DFO has not received any requests to licence this type of aquaculture activity.

### ***Closed Containment***

Closed containment implies a facility designed for the purpose of aquaculture which uses barriers to mitigate or manage interaction between cultured fish and the outside environment. There are a number of variations of closed containment technology which are currently in use in British Columbia.

Hatcheries, juvenile rearing, and adult rearing facilities may all employ closed containment technology. Closed containment may be applied to tanks which are physically located on land or in the marine environment. It is a general term which can be used to imply a number of factors:

- Physical separation of cultured fish through a bag, rigid tank, or isolation on land or in water;
- Treatment of water prior to use for aquaculture purposes and before it is released into the marine or freshwater environment; and/ or
- Cleaning and recirculation of water.

### ***Industry Structure***

Marine finfish aquaculture is a complex and large scale business, which requires considerable expertise and capital. On average, the British Columbia Salmon Farmers' Association (BCSFA) estimates that a new marine salmon farm site costs over \$1,000,000 to bring on-line, and the investment in a cycle of salmon which would be raised on an average farm is over \$2,000,000. Due to the overhead costs associated with salmon aquaculture, aquaculture is not a fishery where it is anticipated that there will be many new entrants on a year to year basis.

Most aquaculture today is carried out in a marine net-cage environment, but a number of closed containment facilities (some land-based, some placed in the ocean) are also carrying out marine finfish aquaculture or are currently under development. Some new/smaller players may enter the industry developing new species or testing new forms of technology.

There are a number of related industries that also serve the aquaculture industry, in fields ranging from veterinary and laboratory services, to mechanical/ technical/ infrastructure services, environmental and diving services, and added value processing.

## **Locations**

Marine finfish aquaculture takes place in locations throughout B.C. Maps are attached in *Appendix B* which provide an overview of the locations of marine finfish aquaculture in British Columbia.

## **Aquaculture operations and characteristics**

The following provides a very general overview is of marine finfish aquaculture and operations in B.C. For greater depth and detail please see the *IMAP-MF Backgrounder*.

### **Procurement of stock**

Pacific salmon have been reared in a hatchery environment in B.C. since the early 1900s. In its earliest days the salmon aquaculture industry in B.C. acquired eggs from local enhancement facilities. This type of broodstock acquisition still occurs today with limited amounts of enhanced stock being accessed for aquaculture development.

When industry first started farming Atlantic salmon in the mid 1980s they imported eggs from domesticated stock in Europe. Today most companies harvest eggs from their own fish which have been reared in B.C. over many generations and are selectively bred for traits that allow them to do well in the Pacific environment.

### **Hatcheries**

In the case of anadromous fish, when fry emerge from their eggs they are transferred into troughs or tanks. There is a continuous flow of water provided in the tanks, and the fish are fed a diet appropriate to their size. As they grow they are moved into different tanks to maintain the desired stock densities. Culture of species other than salmon and trout may also use hatcheries and tanks to breed and rear young fish.

Hatcheries are required to hold a freshwater aquaculture licence from DFO and are required to comply with all Conditions of Licence (CoL) outlined in that document.<sup>4</sup>

### **Grow-out**

Marine finfish are grown to marketable size in a variety of ways depending on the species and the methods of rearing employed by the aquaculturalists.

After being hatched as fry in a hatchery setting, salmon and trout may be kept in tanks or lake-based net-pens. As juvenile fish are generally kept in a controlled setting (to protect them from disease, predation, etc.), and are certified disease-free by a veterinarian prior to entry into the marine environment. Prior to transfer to salt water, salmon are typically

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<sup>4</sup> Reference to Land-based freshwater aquaculture conditions of licence.

given immunizations, either through a bath or by injection. Fish are then usually transferred to ocean net-pens or land-based facilities by trucks and/or live haul boats, which will gradually introduce them to sea water. When they arrive they are placed into ocean or land-based pens. Completion of a production cycle can take up to five years when broodstock selection, production schedules and other factors are taken into consideration.

Non-salmonid marine finfish (like black cod) are hatched or bred and then placed directly into land-based or marine-based facilities. In closed containment fish will generally be transferred to various tanks as they increase in size.

### **Grading**

During the time that marine finfish grow out, they may be graded according to their size. Generally, good husbandry practices discourage handling fish frequently, as this increases the stress on the animals. Typically fish are graded (arranged according to rate of growth and maturity) so that various pens/ tanks will be ready for harvest at a consistent time. In order to optimize quality and meet market demands, companies try to ensure that fish are harvested at a standard size.

### **Processing**

Processing of cultured fish in British Columbia is a shared federal/provincial responsibility. Fish are transported from aquaculture facilities to processing facilities either via a live-haul vessel, or killed on site through a stunning and bleeding process when harvested on site just prior to being loaded onto a transport vessel or vehicle.

Most salmon which are the product of the marine finfish aquaculture industry are processed in special fish plants which are designed specifically for salmon aquaculture. Salmon aquaculture companies prefer to time harvest and processing so that the infrastructure of processing plants can operate consistently on a year-round basis. This allows the industry to provide fresh, reliable product throughout the year.

### **Offal**

The marine finfish aquaculture industry generates three main kinds of offal (organic waste produced as a result of the marine finfish aquaculture process): blood water, processing waste, and mortalities.

Blood water is generated as a by-product of harvesting and processing. Processing waste includes any parts of the fish which are discarded during primary and value added processing (innards, heads, tails, bones, etc.), or fish which are not appropriate for processing (mutated, soft flesh, incorrectly processed, bruised, etc.). Mortalities include routine deaths that occur as a part of farm operations, incidental catch of non-target species, and larger mass mortalities that can occur due to harmful algal blooms or disease. The *IMAP-MF Backgrounder (in development)* provides additional information on offal disposal and regulation.

## **Feed**

Most of the fish food for the marine finfish aquaculture industry in B.C. is manufactured at one of two plants in the Lower Mainland, or is imported. Generally salmon are fed manufactured pellets with a fishmeal content of 30-70% for juveniles and 20-50% for adults. The fishmeal content is derived from wild pelagic (open ocean) fish such as anchovy, menhaden and capelin, often sourced from the southern hemisphere. No directed fisheries take place in British Columbia for fish meal or fish oil not intended for human consumption.

Use of additives is regulated through the Canadian Food Inspection Agency (see the *IMAP-MF Backgrounder (in development)* for more information). Farmed sablefish are fed dry pellets which are made of fish meal, fish oil (which comes from herring by-catch or pilchards) and wheat. As new species are cultured the aquaculture industry will need to continue to develop new feeds which are most appropriate for the species being cultured.

## **Seasonality**

Today marine finfish aquaculture is not a seasonal industry. Aquaculture companies plan their operations to facilitate a consistent flow of fresh product for their markets, year-round. All aspects of the supply chain, including hatchery operations, growout, and processing, are a part of an overall planning process.

## **Management Approaches**

Marine finfish aquaculture in British Columbia includes a number of elements managed under: legislation; regulation; policy; approaches; and Conditions of Licence. Together these tools form the framework through which marine finfish aquaculture is regulated. Marine finfish aquaculture is a complicated field with numerous governmental jurisdictions engaged. In order to help provide further detail, an *IMAP-MF Backgrounder (in development)* has been developed to provide specific information related to the mechanisms and management approaches taken with respect to the various aspects of marine finfish aquaculture.

The general framework for aquaculture management flows from legislation, both federal and provincial, which outlines the various responsibilities and jurisdictions of government departments. Some of the key legislation and regulations related to the management of aquaculture are outlined in the *IMAP-MF Backgrounder*.

While legislation and regulations provide a legal framework for the management of aquaculture, departmental policies and approaches provide the context and direction for how that authority is translated into a management framework. Numerous federal departments and provincial ministries have many policies and approaches which direct the activities of government staff responsible for managing the aquaculture industry. Policies and approaches are generally adaptive, and will change over time, but the current framework for managing the marine finfish aquaculture industry, including links to key policies and approaches, is outlined in the *IMAP-MF Backgrounder*.

DFO is the lead federal agency responsible for developing and implementing legislation, regulations, policies and programs in support of Canada's scientific, ecological, social and economic interests in oceans and fresh waters. Aquaculture licences in B.C. are issued, administered, and enforced under the authority of the *Fisheries Act*, the *Pacific Aquaculture Regulations*, and the *Fishery (General) Regulations*. The *Fisheries Act* and its other regulations, as well as the *Oceans Act* also continue to apply to B.C. aquaculture.

Within DFO, the Aquaculture Management Directorate (AMD) is the focal point for the department's aquaculture related policies and activities. The regional AMD office provides a focal point for DFO to work with the province, First Nations, industry and other stakeholders. Other divisions within DFO also have links to aquaculture including Resource Management, Science, Oceans, Habitat Management, Policy, and Communications.

Conditions of Licence provide the legal vehicle through which DFO authorizes and controls the activity of aquaculture. Various aspects of marine finfish aquaculture are authorized under the marine finfish and the freshwater aquaculture Conditions of Licence.<sup>5</sup> There are standard templates which have been developed for each type of licence, however site specific elements are also added to individual licences where appropriate.

All persons or companies carrying on the activity of aquaculture were required to have a valid federal aquaculture licence effective December 19, 2010. It is the responsibility of licence holders to be informed of, and to comply with all Acts and Regulations, federal, provincial or local, that relate to the activities which will be carried out as a part of aquaculture-related activities. Every attempt has been made to summarize the relevant requirements in the *IMAP-MF Backgrounder*, however the activities associated with aquaculture are diverse and complex, and there will be additional requirements for aquaculture operators which are not summarized. It is the responsibility of licence holders to be informed of and comply with all laws, bylaws and orders of any competent government authorities which affect the aquaculture facility for which the licence is issued.

## **Governance**

Governance, according to the *Food and Agriculture Organization* of the United Nations (FAO), can include both: (i) the activity or process of governing; (ii) those people charged with the duty of governing; and (iii) the manner, method and system by which a particular society is governed. In fisheries it is usually understood as the sum of the legal, social, economic and political arrangements used to manage fisheries. It has international, national and local dimensions. It includes legally binding rules, such as national legislation or international treaties as well as customary social arrangements. It can refer

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<sup>5</sup> Marine finfish Conditions of Licence are available online at the following link: <http://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/mar-eng.htm> . Freshwater Conditions of Licence are available online at the following link: <http://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/fresh-douce-eng.htm> .

to instruments, processes, and institutions. The FAO distinguishes between **policy** (high level governance) and **management** (medium to low level governance).<sup>6</sup>

Today, the lead authority for the governance of aquaculture in British Columbia is under the jurisdiction of the Minister of Fisheries and Oceans Canada. This provides the authority for the development of policies and plans, for the establishment of advisory processes, and for the development of management tools like the Conditions of Licence.

Within those jurisdictions managed by DFO, the ultimate authority for all decisions rests with the Minister of Fisheries and Oceans Canada. With respect to key policies and plans, DFO senior executives and national headquarters staff play a coordination role to ensure that there is consistency in the management approach related to the federal management of aquaculture across Canada. Within this policy and planning framework the DFO Regions are delegated the responsibility for establishing advisory processes, establishing management issues and objectives and undertaking evaluative reviews, and implementing region-wide or area management processes.

Within B.C. there are no comprehensive land claims agreements in place, but there are a number of Treaties and final agreements which have been negotiated. Some of these have specific clauses which relate to shellfish aquaculture, but at this time none specifically relate to marine finfish aquaculture. Some agreements have sections that relate to the need for First Nations to be involved in decision-making on issues like land use, environmental assessment, and establishment/management of protected areas. How these agreements and others, yet to be finalized, will relate to the future management of marine finfish aquaculture, will evolve as these agreements are implemented.

There are many aspects of aquaculture management which are regulated outside of the authority of DFO. As the lead authority related to the licensing of aquaculture, DFO will work to bring these interests together in order to ensure that the governance of aquaculture is harmonized, and that governments, along with First Nations, industry, and other stakeholders, can provide the best advice to undertake adaptive management and continually improve the management of the marine finfish aquaculture industry to support the best possible outcomes for the industry, the environment, and Canadians.

### **Advisory Committees**

The IMAP process is intended to be a key feature of the British Columbia Aquaculture Regulatory Program (BCARP). It will include a formal advisory process. The IMAP planning process is intended to support the conservation and sustainable use of aquaculture resources, by identifying the main goals for an aquaculture fishery and the approach by which aquaculture activities will be managed. These objectives and approaches will be reflected in the eventual plan that emerges through consultation with First Nations, industry and stakeholders. Issues identified through the IMAP process, could result in BCARP policy changes, changes to Conditions of Licence or more specific technical changes relevant to aquaculture.

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<sup>6</sup> Available on the FAO website at: <http://www.fao.org/fishery/topic/12271/en>

DFO works to engage a variety of interests and groups in the provision of management-related advice through the development of advisory committees. Many parties need to be engaged in the planning and management process for marine finfish aquaculture. Some parties bring a right or a jurisdiction to the table, which needs to be considered; some are interested parties, with value to add to the management process. It is expected that interested participants in aquaculture management advisory processes will include (but are not limited to):

- Government of Canada
- Government of British Columbia
- First Nations
- Municipalities
- Aquaculture Industry
- Processors
- Commercial Fishing Organizations
- Environmental Organizations

For the purposes of implementing the IMAP planning processes, a key matter for consideration involves the size and composition of the advisory panel. The specific design of IMAP advisory boards will vary but should be appropriate for the specific sector or area under consideration. Committees should be designed to achieve balanced and broad-gauged representation.

In many parts of the world, Area-Based Management of aquaculture is now being used to improve environmental performance and the engagement of local interests in decision-making, which may impact them. DFO will be working with First Nations, industry, and other stakeholders, in order to develop an approach to management and engagement in advisory committees, which best utilizes the expertise and knowledge of participants in the development of Region-wide Management Plans and Area-Based Operational Plans.

There are number of fisheries and oceans planning and management initiatives which relate to shellfish aquaculture management, including the Pacific North Coast Integrated Management Initiative, Wild Salmon Policy implementation, and the Pacific Integrated Commercial Fisheries Initiative. DFO will work to ensure that linkages are formed with these processes, to ensure that the management of aquaculture is coordinated with, and benefits from, ongoing consultations and advisory processes being undertaken in other sectors.

DFO is interested in exploring discussions, related to the incorporation of a scale-based management approach, into the management of aquaculture and associated advisory committees. The establishment of advisory committees does not fetter the authority of the Minister of Fisheries and Oceans Canada.

Advisory committees will be established in a manner that is prudent fiscally, and which links in a complementary manner with other advisory processes which have been put into place by DFO.

The effectiveness of advisory committees will depend not only on a panel's composition, but also on its terms of reference, developed through consultation with First Nations, industry, and other stakeholders. In institutionalizing the IMAP process, a key step will involve the development of terms of reference for the advisory panel. An important issue for consideration pertains to what the general terms of reference for advisory committees should be.

### **3. Policy Framework**

After a British Columbia Supreme Court ruling that struck down most provincial regulations for aquaculture in the province, Fisheries and Oceans Canada has been active in building an aquaculture regulatory regime for British Columbia under the *Fisheries Act*. Aquaculture in B.C. is now managed under the Act and its regulations, notably the *Pacific Aquaculture Regulations* and the *Fisheries (General) Regulations*.

In its capacity as regulatory lead for aquaculture in B.C., Fisheries and Oceans Canada has committed to developing an explicit policy framework in support of transparent delivery of its new responsibilities. Work on this *Sustainable Aquaculture Fisheries Framework* (SAFF) is underway and is intended to reflect the areas where policy direction is expected to be required, in order to implement the BC Aquaculture Regulatory Program (BCARP).

DFO is already managing the aquaculture sector, as of December 2010; Conditions of Licence reflect the current management approach. DFO is in the process of codifying the existing management practices, along with the underlying science and management context, in a series of policies. These documents represent the starting point for future policy work, as the formal IMAP advisory process gets underway. A number of policies have been released, or will shortly be released; the balance are under development by DFO, based on input from First Nations, industry and stakeholders.

The relative priority of the various policy areas for discussion review could be a matter for consideration through the IMAP development process.

#### ***Framework Elements***

The *Sustainable Aquaculture Fisheries Framework* is made up the following broad elements:

- Conservation, ecosystem and sustainable use policies;
- Economic and Governance policies;
- Planning, processes and regime performance monitoring tools;
- Operational implementation.

## **Conservation, Ecosystem and Sustainable Use Policies**

Proposed Policies with Respect to Environmental Management: including management objectives; science and management context, mitigation and management measures; and application to sectors, in terms of application requirements, siting decisions, and

Conditions of Licence:

- General Environmental Management Approach;
- Management of Feed Related Organics, encompassing management related to benthic and farfield impacts at local and cumulative effects level;
- Management of Non-Feed Related Organics;
- Management of Fish Health, encompassing management related to potential disease transfer between farmed and wild fish, disease prevention and control;
- Pest Management, encompassing management related to sea lice and management measures;
- Management of Light, encompassing management of lights related to potential ecological impacts;
- Management of Noise, encompassing management of noise related to potential ecological impacts
- Management of the Release and Removal of Fish, encompassing among other matters incidental catch, transfer of fish, species and criteria for routine transfer, escape of fish and related wild fish interaction concerns, and marine mammal issues;
- Management of Chemicals and Litter, encompassing such areas as use of therapeutant drugs by the aquaculture industry (including concern about impact on shellfish);
- Policy on Access to Wild Fish Stocks for Aquaculture Purposes – **Released in 2005, update under consideration;**
- Approaches with respect to consideration and management of cumulative effects;
- Approach to Identifying, Assessing and Managing Impacts of Aquaculture Activities (Ecological Risk Assessment and Management Framework);
- Application of an Ecosystem-Based Approach to Aquaculture Fisheries Management;
- Application of the Precautionary Approach to Aquaculture Fisheries Management;
- Approaches with respect to Species at Risk and SARA;
- Identification and Management of Environmental Impacts Under the British Columbia Aquaculture Regulatory Regime -- **Released**

## ***Economic and Governance Policies***

- Licensing Approach - ***Released***
- Policy on Public Reporting of Regulatory Information -- ***Released***
- Approach to Use of Observers and Third Parties for Aquaculture Operations
- Verification of Certification and Technical Qualifications
- Use and Approvals of Licence-holder Management Plans
- Traceability Approaches on Farm
- Ocean-to-Plate Approach to Commercial Fisheries and Aquaculture - Released
- Approach to Collaborative Arrangements
- Limitation of access of non-licence holders to aquaculture sites
- Compliance Approaches and Objectives
- First Nations Engagement
- Sustainable Development of Aquaculture Policy (update)
- Licence Fees

## ***Planning and Monitoring***

- Aquaculture Management Performance Checklist
- Risk management processes and Science/Management Interface:
- Ecological Risk Management Process for Aquaculture
- A Framework for Socio-Economic Analysis to Inform Integrated Management Planning, Site Access and Expansion Decisions
- Consideration of Traditional Ecological Knowledge in Decision-making

## ***Operational Implementation***

- Integrated Management of Aquaculture Plans: Marine Finfish, Shellfish, Freshwater – ***In progress.***
- Supporting Regulatory Field and Other Operational Protocols
- For DFO Staff (e.g. Biosecurity Procedures, Inspection checklists, etc.)
- For Licencees (e.g. Reporting templates, Management Plan table of contents, etc.)
- Operational Plans (annual)
- Licensing Plan
- Compliance and Enforcement Plan
- Public Reporting Plan

- Plans for Environmental Surveillance and Audits (e.g. fish health, sea lice, benthic)

## 4. Science

### ***Science State of Knowledge***

Adaptive and science-based management approaches are at the foundation of the Department of Fisheries and Oceans Canada's (DFO) approach to the implementation of the Pacific Aquaculture Regulations and the development of the British Columbia Aquaculture Regulatory Program. Clear and impartial science advice on marine ecosystem structure and function, and targeted research on how aquaculture activities interact with these environments, are critical to sustainable fisheries management, the protection of fish and fish habitat and continuous improvement of regulatory and management frameworks.

The Department has an ongoing program of scientific study to improve understanding of broad ecosystem processes and aquaculture-ecosystem interactions. The broad range of aquaculture research initiatives currently being undertaken as well as those completed in recent years are summarized in the *Canadian Aquaculture Research & Development Review*.<sup>7</sup>

The Department has undertaken a number of comprehensive science reviews that evaluated the state of knowledge and research needs in the area of aquaculture-environment interactions:

#### State of Knowledge Initiative (2003-2006)

Peer reviewed reports examining the potential environmental effects of finfish and shellfish aquaculture activities including interactions between farmed and wild species (e.g. disease transfer, genetic and ecological effects) and the impact of wastes (e.g. fate and effect of nutrient and organic matter release).<sup>8</sup>

*National Advisory Process* (2005 – Finfish Aquaculture, 2006 – Shellfish Aquaculture).

Coordinated through the Canadian Science Advisory Secretariat (CSAS) these processes reviewed the potential impact of aquaculture on fish habitat, environmental indicators of impacts at a range of spatial scales, and modeling techniques to predict these impacts.<sup>9</sup>

#### *Aquaculture Pathways of Effects* (2009)

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<sup>7</sup> The *Canadian Aquaculture Research & Development Review* can be accessed here: <http://www.dfo-mpo.gc.ca/aquaculture/RD2007/toc-tdm-eng.htm>, <http://www.dfo-mpo.gc.ca/aquaculture/RD2009/toc-tdm-eng.htm>.

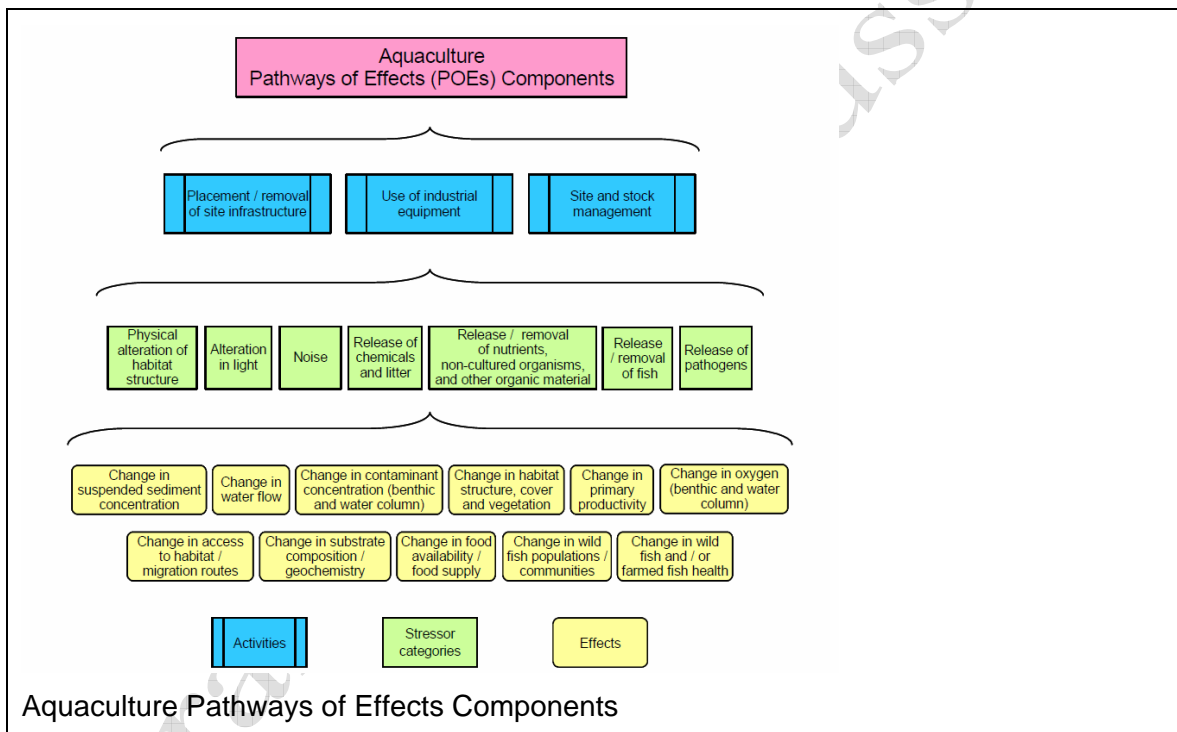
<sup>8</sup> The *State of Knowledge Initiative* is available online here: <http://www.dfo-mpo.gc.ca/science/enviro/aquaculture/index-eng.htm>.

<sup>9</sup> *National Advisory Process* information can be found online here: [http://www.dfo-mpo.gc.ca/csas/Csas/status/2005/SAR-AS2005\\_034\\_E.pdf](http://www.dfo-mpo.gc.ca/csas/Csas/status/2005/SAR-AS2005_034_E.pdf); [http://www.dfo-mpo.gc.ca/csas/Csas/status/2006/SAR-AS2006\\_005\\_E.pdf](http://www.dfo-mpo.gc.ca/csas/Csas/status/2006/SAR-AS2006_005_E.pdf)

This CSAS peer review process evaluated the state of knowledge associated with a broad range of potential aquaculture-environment interactions as detailed in the figure below.<sup>10</sup>

In addition to these broad review processes, individual CSAS processes are routinely undertaken to evaluate emerging issues and science developments. The resulting Advisory Reports, Research Documents and Proceedings documents are posted on the CSAS website.<sup>11</sup>

The Department recognizes the importance of research on aquaculture-environmental interactions (and broader marine ecosystem and fisheries issues) that is conducted by individuals and institutions (e.g. Universities, ENGOs, private consultants, First Nations). The reports and publications resulting from these studies are also included and evaluated through CSAS review processes. This includes participation of external experts at CSAS peer review process workshops and active involvement in the formulation of Science Advisory documents.



The science advice flowing from these processes is incorporated into the development of policies and approaches for aquaculture management. In circumstances where data gaps exist or the results from different studies are not clear, the Department will take a more cautious management approach than in areas where scientific consensus has been attained. Where further research needs are identified, these are evaluated and prioritized, along with other emerging issues, for targeted science funding and analysis.

<sup>10</sup> Aquaculture Pathway of Effects information can be found online here: [http://www.dfo-mpo.gc.ca/csas-sccs/publications/sar-as/2009/2009\\_071-eng.htm](http://www.dfo-mpo.gc.ca/csas-sccs/publications/sar-as/2009/2009_071-eng.htm)

<sup>11</sup> The CSAS website is online here: <http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm>.

## ***Developing Science and Research Priorities***

As the advisory processes associated with aquaculture management in the Pacific Region are developed, DFO intends to work collaboratively with First Nations, industry, and stakeholders to develop ongoing science and research priorities.

A national prioritization exercise conducted by DFO in 2011 yielded the following list of science and research priorities for aquaculture:

- Integrated Pest Management Approaches (e.g. Sea lice management approaches, tunicate management approaches, aquatic invasive species assessment).
- Area Based Management Strategies (e.g. Fish health zones, transfer zones, carrying capacity assessment, ecosystem assessment to support potential boundary delineation, cultured/non-cultured fish interactions).
- Habitat Impacts (e.g. Aquaculture activity effects assessment for different culture types, assessment of dynamics of effects from increased deposition, far-field and cumulative issues).
- Introductions and Transfers and Access Issues (e.g. non-indigenous species assessment, cultured stock escapes assessment, incidental catch evaluation).

DFO intends to use advisory committee processes to help establish guidance for science and research priorities. Science and research will be most effective if governments, First Nations, industry, and other stakeholders work collaboratively both to identify priorities and to carry out initiatives.

## ***Science for Sustainable Aquaculture***

Effective strategic action planning, regulatory reform, innovation and market access, certification and sustainability reporting are all founded on sound scientific knowledge. DFO science for sustainable fisheries and aquaculture provides advice and recommendations based on scientific research and monitoring as well as providing products and services and the management of data on Canada's aquatic resources. The Program for Aquaculture Regulatory Research ensures departmental and federal policies, programs, decisions, and regulations associated with sustainable aquaculture are informed by scientific knowledge. The Canadian Science Advisory Secretariat coordinates the peer review of scientific issues for the Department of Fisheries and Oceans. The science of these and other DFO programs is provided through a network of research facilities, in collaboration with other government departments, private sector, academia and international organizations.

## ***Integration of Traditional and Local Knowledge***

DFO plans to facilitate dialogue between governments, industry, First Nations and local communities, both bilaterally and through the establishment of area-based planning initiatives, to integrate traditional and local knowledge into both planning and management of marine finfish aquaculture and the development of future science and research priorities. Through collaborative initiatives with First Nations and local

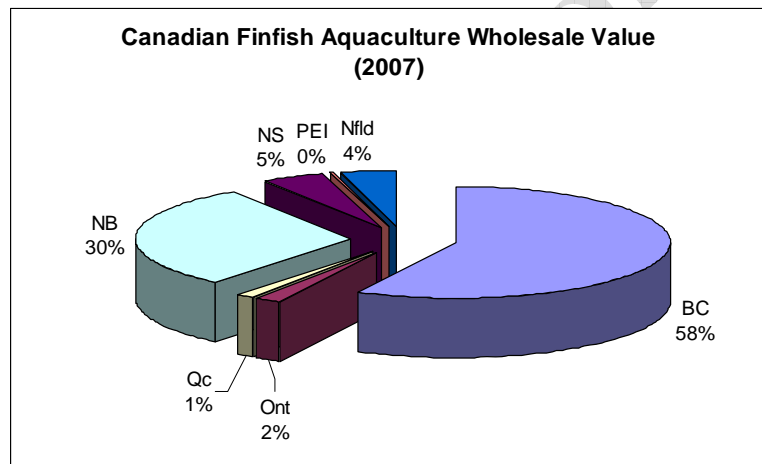
communities it is DFO's intent to better understand how traditional and local knowledge can be utilized to improve the management of aquaculture in the future.

## 5. Economics, Social, and Cultural Importance

### *Economic statistics*

At present, the main product of the marine finfish aquaculture industry in British Columbia is farmed salmon: 95% Atlantic salmon and 5% Pacific salmon. The only other significant aquaculture producer of farmed salmon in Canada is New Brunswick.

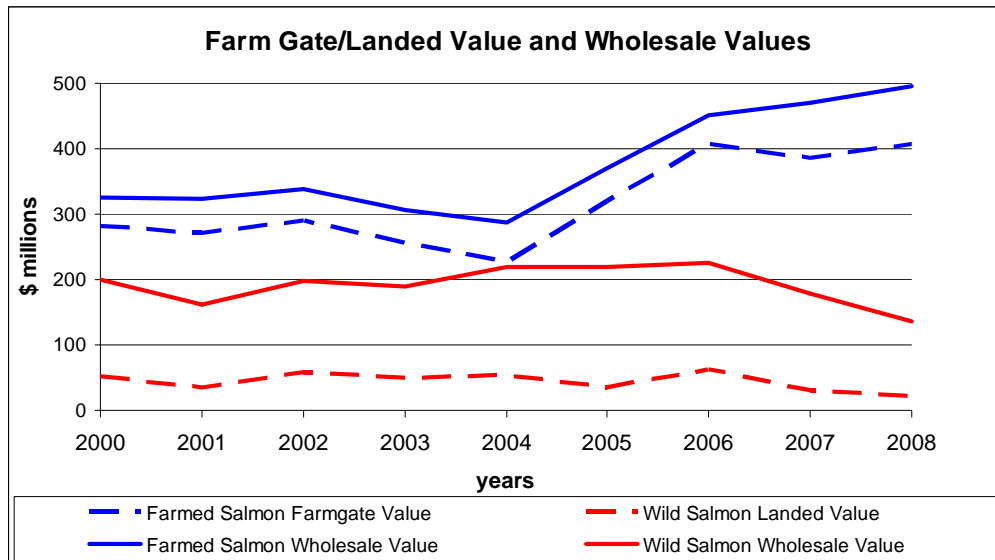
Canada produces approximately 7% of the world's farmed salmon. The farm gate value of B.C. cultured salmon has grown such that on an annual basis it now surpasses the landed value of all B.C. wild and enhanced fisheries combined. The processing of farmed salmon, however, does not create as much value added per unit of measure as the processing of wild and enhanced salmon or



some other wild species. For example, in 2008, while the annual landed value of all wild and enhanced fisheries in B.C. was an estimated \$288 million (\$20M from salmon); finfish aquaculture farm gate value was \$406 million. The processing of the farm salmon only added \$89 million to its value (22%), while the processing of the wild salmon added \$115 million to its value (6 times the landed value).

In B.C. there are now only 4 large salmon aquaculture companies, down from approximately 100 in the 1980s. The four key producers are Marine Harvest Canada, Mainstream Canada, Grieg Seafood and Creative Salmon. The first two are by far the largest: Marine Harvest Canada have 75 sites and are responsible for 55% of provincial aquaculture finfish production; Mainstream Canada have 30 sites and 24% of the production; Grieg have 17 sites and 13% of the production; and Creative Salmon (which grow-out Chinook salmon) have 6 sites and 4% of the production. All four operators have a certain level of vertical integration in their operations as they run hatcheries, grown out farms and processing facilities, although they may also use independent

processors.



There are also a limited number of other companies doing smaller scale aquaculture and looking at new species for aquaculture. This includes Kyuquot Sound Sablefish, one company marketing sablefish/ black cod on a commercial scale.

### **Employment**

Employment estimates using the provincial Input-Output model show just under 2,000 Person-Year (PY) of employment in finfish aquaculture operations in 2008<sup>12</sup> with approximately 1,343 PY involved at the farm site itself<sup>13</sup> (i.e. not involved in transportation, processing or marketing). In addition, another 2,060 PY are created in the sectors which supply aquaculture companies in inputs such as feed, boats, etc, and another 1,248 PY would be created by the spending of income generated by the aquaculture companies and their suppliers. In total finfish aquaculture companies in the province supported more than 5,200 PY.

Most salmon farming jobs are full-time and year-long and located between Comox and Port Hardy, along the corridor created by Vancouver Island and the mainland. Processing employment is found in plants in the same area but can also depend on plants found in larger centers outside the area. As the supply of input to the plants does not depend on fishing seasons, the work is not seasonal. Salmon farming was responsible for \$200 million in labour income in 2008 (direct, indirect and induced). The labour force is divided in two large groups: labourers and technicians, with support and management staff making up the rest. Although the average wage for aquaculture workers is close to

<sup>12</sup> Given the vertical integration prevalent in the industry, the I/O multiplier is applied to every million \$ of finfish wholesale value and not farm gate value.

<sup>13</sup> Using a methodology developed by BC Ministry of Environment for its 2003 BC Aquaculture Employment Survey. (see <http://www.env.gov.bc.ca/omfd/fishstats/aqua/employ-03.html>)

\$27,000,<sup>14</sup> technicians and other experts would make significantly more and labourers likely less.

A recent report commissioned for the Mt. Waddington Regional District on Northern Vancouver Island estimated that the finfish aquaculture industry directly contributes \$19.2 million in wages and 400 person years employment (full time equivalents (FTEs)) annually, which comprises a significant portion of the economy of that area.<sup>15</sup>

<b><i>Employment and Income from Salmon Aquaculture</i></b>				
	British Columbia		Comox-Port Hardy Corridor	
	Employment (FTE)	Income (\$000s)	Employment (FTE)	Income (\$000s)
Direct	1,966	69,328	1,966	69,328
Indirect	2,060	84,184	1,030	42,092
Induced	1,248	44,568	624	22,284
total	5,274	198,080	3,620	133,704

Sources: Statistics Canada, *Interprovincial Input-Output Model, 2005*; *BC Seafood year in review 2008 and Gardner (2010)*

The aquaculture labour force is essentially young and this is particularly true in contrast to the wild and enhanced commercial fisheries. Roughly 60% of finfish farm employment is held by people under the age of forty but more than 40% of commercial fishermen are 55 years of age or older.

### ***Markets and Prices***

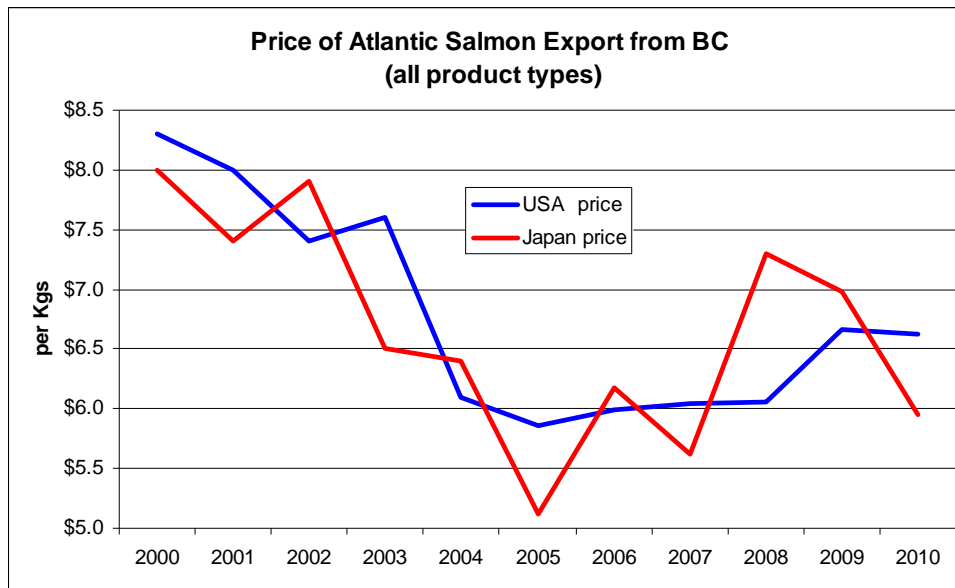
Farmed salmon initially began production as a high-end product and in the late 1980s B.C. farmed salmon sold for over \$9/kg. The size of the international supply is now such that it is treated more as a commodity. In the early 2000s increased global production translated into a lowering of prices but since then demand for farmed salmon has increased faster than supply and prices have been increasing.

The main product for BC farmed salmon is chilled/frozen gutted/headed whole fish whose price on the export markets is now getting close to \$7/kg but was closer to \$5.50 a few years ago. Processed products such as frozen fillets can fetch over \$9/kg but only

<sup>14</sup> Statistics Canada, Tax filer data, DFO special run

<sup>15</sup> “The *Marine Economy & the Regional District of Mt. Waddington*” prepared for the Living Oceans Society and Regional District of Mt. Waddington, March 2011.

make up a small share of exports (5% in 2010). The main markets are the United States (~65% of B.C. wholesale value) followed by the domestic market (~25% of B.C. wholesale value) and then, a distant third, Japan. Exports to Japan can fluctuate considerably from year to year but have been following a downward trend since 2008. It is also interesting to note that export numbers from 2011 do not show a change in pattern following the March earthquake and tsunami.



B.C. aquaculture operators take advantage of their close proximity to American markets by trucking chilled/frozen whole fish to the U.S. where it can be processed into higher value added fillets, etc. This results in a fresher product for sale in the U.S. and also benefits from cheaper labour south of the border which translates into a slight price premium for Canadian farmed salmon. The costs of transporting whole fish to the U.S. means that other countries find it expensive to do the same. Hence, Canada occupies a slightly different market in the U.S. than Chile – its main competitor. British Columbia supplies mostly lower value added whole aquaculture salmon, while Chile is the main supplier of value-added products such as fillets.

In 2008 the Chilean production of farmed salmon was dramatically reduced due to the infectious salmon anemia (ISA) disease.<sup>16</sup> Since Chile is one of the world's largest producers, the impact on price was immediate. B.C. producers have benefited from both the higher prices and the access to Chile's share of the American market. There is evidence that Canada and its competitors are actively trying to take over some of the Chilean market share<sup>17</sup> before Chilean producers begin to increase production in the years ahead.

<sup>16</sup> For more information on ISA see the *IMAP-MF Backgrounder*.

<sup>17</sup> Gardner (2010)

Other important impacts on markets and prices have been the strong Canadian dollar and the economic downturn. While a strong dollar Canadian dollar has definitely lowered the purchasing power of B.C. aquaculture farms' main customer, the impact of this and of the economic downturn is not easy to determine. Certainly, total quantities exported to the U.S. have stayed close to historic peaks.

Farmed salmon is an international commodity, and the value of salmon produced in British Columbia is affected by global pricing trends. From the early 1990s until 2002/2003, the overall global price of farmed salmon trended downward as additional supply entered the market. Since 2002/2003 the prices for farmed salmon have gradually trended upward.

Salmon aquaculture and its related infrastructure and spin off benefits are estimated by the salmon aquaculture industry to contribute \$800,000,000 in economic activity to British Columbia on an annual basis. The marine finfish aquaculture sector is a significant contributor to the economy of the Central Coast and Vancouver Island, as well as to British Columbia and Canada.

### ***Social and Cultural Linkages***

Local communities and First Nations in British Columbia may have unique and specific perspectives on marine finfish aquaculture. Through the IMAP-MF advisory committees, and the opportunities to explore area-based/ ecosystem approaches, DFO hopes to work with communities to better understand their individual relationships with the marine finfish aquaculture industry, and to work toward ensuring that the management system builds upon and supports healthy and strong participation of First Nations and communities in planning, management, and decision-making.

## **6. Management Issues**

### ***Identifying Management Issues***

The purpose of this section of the IMAP is to summarize the key current priority management challenges and problems facing the sector, identified for consideration in the next 1 – 5 years through the IMAP advisory process.

The Management Issues section of the IMAP provides an opportunity for DFO to work with First Nations, industry, and other stakeholders, to identify priority areas of concern related to the management of marine finfish aquaculture. Priority management issues will be selected and scoped as a part of IMAP-MF processes, and are expected to evolve over time.

Management issues will likely relate to sustainability themes including the following broad sustainability objectives for aquaculture:

- Economic and Governance - Ensuring Effective and Efficient Governance
  - Effective national and local laws, regulations and government programs to be in place and enforced to support sustainable aquaculture in all three

dimensions of sustainability: environmental protection, social well-being, and economic prosperity.

- First Nations issues (which may include but are not limited to: protection of the environment, engagement in governance, and participation in/benefit from the industry).
- Policies on licensing, use of licensee management plans, collaborative arrangements, etc.
- Conservation, ecosystem and sustainable use - Maintaining Healthy and Productive Ecosystems
  - Operate in a manner that maintains the health and productivity of the ecosystems in which it operates, and on which it depends, within acceptable limits
  - Optimize health and welfare through minimizing stress, reducing disease risks and maintaining a healthy culture environment
- Planning, processes and regime performance monitoring tools;
- Operational implementation, including but not limited to, compliance and enforcement issues.

Areas outside DFO's jurisdiction but of potential interest include:

- Ensuring Food Safety and Traceability
  - The products of aquaculture are safe and healthy to eat and that the origin of these products is traceable at every stage of the production cycle.

Through consultation related to the IMAP-MF development, DFO will be working with other governments, First Nations, industry, and other stakeholders to identify priority Management Issues. Some items which have been raised in the past which DFO will be seeking feedback on include:

- Area-Based Management and the need to confirm what management and decisions (including siting plans, science, operational, compliance) should be made at various geographic scales, and how this might link to policy renewal, advisory processes and engagement;
- First Nations engagement in aquaculture management (including the need to further the relationship to better define how First Nations want to be engaged in aquaculture and aquaculture governance, and to seek recommendations for the future evolution of the industry);
- Ecosystem-based management and setting of policy renewal and science priorities – looking at how will this evolve and ways to incorporate an analysis of data trends and methods of mitigating potential impacts on fish, birds, mammals, incidental catch, SARA species, etc.;
- Supporting industry growth and development;

- Confirming what species are approved for aquaculture, what are allowed in an experimental stage, and what is the process for having species approved;
- Better defining what is the appropriate levels of risk are in the management of a precautionary approach in decision-making – finding the right balance that takes reasonable steps to protect the environment while supporting business and development.

In addition to collaborative work that will take place related to the identification of priority management issues, the *IMAP-MF Backgrounder (in development)* will provide a summary of a number of commonly raised marine finfish aquaculture technical management issues. These Questions and Management Response Worksheets will be a focal point for discussion in future years among aquaculture advisory committees, and the content of these Worksheets may be amended as adaptive management of marine finfish aquaculture evolves.

The format of the worksheets is proposed to be as follows:

- Description of concern/issue;
- Policy
- Overview of related science and information;
- Gaps or uncertainties;
- Description of management approach/ response (Regional); and
- Description of management approach/ response (Local).

The most frequently raised issues which DFO proposes will form the basis for the first iteration of worksheets include:

- Escapes and possible colonization of local rivers by Atlantic salmon;
- Possibility of disease transfer between farmed and wild fish;
- Incidental catch;
- Benthic (nearfield) impacts on the seabed in the immediate area of a farm;
- Ecosystem (farfield) impacts including cumulative effects;
- Use of therapeutant drugs by the aquaculture industry (including concern about impact on shellfish);
- Impact of aquaculture on sea lice levels in wild fish;
- Use of lights and their impacts;
- Marine mammal interactions with aquaculture; and
- Possibility of impact on clam beds and eelgrass in vicinity of aquaculture licences.

This suite can be amended based on feedback from consultation processes.

## ***General Objectives & Measures***

General objectives and measures will form the response set out to address and resolve the identified priority management issues identified earlier in this section. They are generally meant to be included in an annual management plan. Objectives are meant to be specific, measurable, attainable, relevant and timely. This section of the IMAP will speak to the issue of converting the management issues identified into measurable objectives.

This will likely involve exploration of management issues by aquaculture advisory committees, and the development of objectives and related criteria and indicators (methods of measuring success). Also a review schedule should be established in order to help assess improvements and success.

Linked to the policy base, objectives may be articulated, and/or performance tracked, related to matters such as:

- economic objectives;
- indicators of impacts with cautionary and critical environment impact thresholds
- management performance with respect to event response plans, compliance, and reporting
- incorporation of assessment of cost/benefit of required management measures.

Management objectives, criteria, and indicators may also be used to set objectives for the performance and the management of the marine finfish aquaculture industry in the Pacific Region. A matter for consideration is the identification of circumstances under which regional or local thresholds may be more rigorous than those set in national policy. Management objectives will be reviewed and assessed on a regular basis as a part of the IMAP-MF processes.

## ***Ecosystem-Based Management Measures***

In addition to the identification of Management Issues and General Objectives and Measures, Fisheries and Oceans Canada anticipates that IMAP management plan development will incorporate specific ecosystem-based management measures.

Currently, national guidance is developing on departmental frameworks for ecosystem-based approaches, including the establishment of management objectives and measures. DFO also intends to consult with First Nations, industry, and other stakeholders about their views on how to best incorporate ecosystem-based management measures into the management regime for marine finfish aquaculture within Canada's Pacific waters.

In the aquaculture context, there are management measures already in place that address the pathways of effects across the ecosystem components as outlined in Sections 3 and 6. The aquaculture ecosystem-based objectives may focus on ensuring greater integration across ecosystem functions and elements, and consideration of ecosystems of varying scales. While broad management objectives may be put into place for Canada or for the B.C. coast as a whole, DFO will be looking to First Nations, industry, local communities and other stakeholders for their input and ideas related to the establishment of ecosystem-

based management measures, including the development of performance criteria and indicators, and a review process which can contribute to adaptive management.

## **7. Shared Stewardship Arrangements and Engagement**

In some cases industry, First Nations, environmental organizations, and other stakeholders may undertake special initiatives to help improve shared stewardship, to meet the linked objectives of environmental protection, social licence, and economic prosperity. There are a number of roles that different partners can play in order to advance these common objectives. In the future this section of the IMAP-MF will outline these types of initiatives which are developed outside of the IMAP itself, but which relate to IMAP objectives.

## **8. Reporting, Compliance, Inspection, and Enforcement**

Fisheries and Oceans Canada's approach to reporting, compliance, inspection, and enforcement includes a number of elements. The Conditions of Licence for freshwater and marine finfish aquaculture compel licence-holders to file a number of reports on a regular basis. Information contained in many of these reports is released publicly by DFO through its aquaculture public reporting commitment. In addition to the review of information submitted by industry, both the Aquaculture Environmental Operations Program and the Conservation and Protection Program provide audit and compliance monitoring and inspections, and the Conservation and Protection Program provides follow up enforcement.

### ***Public Reporting***

Fisheries and Oceans Canada had committed to improving the transparency of information and to making information relating to the management of aquaculture more accessible. Information relating to key management issues with respect to the practice of marine finfish aquaculture is collected both through reporting required under the Conditions of Licence and through site visits conducted by the Department. A *Public Reporting Policy*<sup>18</sup> has been developed to outline the commitment of the Government of Canada with respect to the release of information relating to aquaculture and aquaculture management. Publicly released information for marine finfish is available on the DFO public website.<sup>19</sup>

### ***Compliance and Enforcement***

Marine finfish aquaculture is a complex industry which involves a number of federal and provincial *Acts, Regulations, and Policies*. Compliance and enforcement of the industry is also therefore shared among a number of jurisdictions.

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<sup>18</sup> Insert reference once Policy is approved and posted.

<sup>19</sup> Public reporting information is available here: <http://www.pac.dfo-mpo.gc.ca/aquaculture/reporting-rapports/index-eng.htm> .

With respect to federal areas of responsibility, Fisheries and Oceans Canada is the main agency dealing with compliance and enforcement issues. Compliance is dealt with both through management of the industry by Aquaculture Environmental Operations staff and through directed activities of the Conservation and Protection group within DFO.

DFO has set out a general approach within the *British Columbia Aquaculture Compliance & Enforcement Strategy*.<sup>20</sup> In the future, as statistics on compliance are obtained, and advisory processes developed, DFO intends to develop an annual *Aquaculture Enforcement Plan*. The Plan will be informed by and relate to: operational objectives (as outlined in the Conditions of Licence); IMAPs; and Region-wide Management Plans and Area Operational Plans as they are developed. Compliance reporting reviews will be prepared to summarize results associated with the *Aquaculture Enforcement Plan*.

### **Reporting of Aquaculture Concerns**

If individuals have reason to believe that the aquaculture Conditions of Licence<sup>21</sup> are not being complied with or accurately reported, or if there are concerns related to escapes or environmental damage, these should be reported to Fisheries and Oceans Canada through the Observe, Record and Report (ORR) Line at 1-800-465-4336. All calls to the Observe, Record and Report Line are logged into the DFO management systems and issues related to aquaculture will be referred directly to Conservation and Protection Officers who are specialists in the area of aquaculture. Persons calling the ORR Line should be prepared to report:

- Date, time and location (e.g.: nearest town, fishing location)
- Identity or description of violators (e.g.: height, weight, hair colour)
- Boat or vehicle description (e.g.: licence, colour, make)
- Evidence at the scene
- Action of violator(s)

### **Conservation and Protection Program Description & Program Delivery**

The Conservation and Protection program promotes and maintains compliance with legislation, regulations, and management measures implemented to achieve the conservation and sustainable use of Canada's aquatic resources, and the protection of species at risk, fish habitat and oceans.

The program is delivered through balanced regulatory management and enforcement approach including:

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<sup>20</sup> This report can be found on-line: [here](#).

<sup>21</sup> The marine finfish aquaculture Conditions of Licence are available here: <http://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/mar-eng.htm> .

- Promotion of compliance through education and shared stewardship;
- Monitoring, control, and surveillance activities; and
- Management of major cases/ special investigations in relation to complex compliance issues.

Activities of the Conservation and Protection Program in DFO include:

- Tracking and maintaining information relating to occurrences, investigations and prosecutions;
- Main program activities;
- Management of fishery patrol vessels;
- Conduct of air surveillance;
- Coordination of enforcement issues and strategies;
- Randomly visit sites to inspect and complete Finfish Aquaculture Site Inspection Checklist;<sup>22</sup>
- Auditing of management plans; and
- Reporting/ analysis and follow up.

Over time, baseline compliance information will be generated and tracked from year to year, in order to provide ongoing management information related to the marine finfish industry as a whole. IMAP-MF processes will also inform priority areas related to enforcement work. This information, along with results and reporting, will inform the adaptive management of future compliance and enforcement plans.

## 9. Performance Review

Fisheries and Oceans Canada is committed to a process of adaptive and continuous improvement in the management of marine finfish aquaculture. The IMAP-MF sets out general direction and guidance with respect to the performance review of management objectives.

The management of aquaculture takes place within a broader framework of the objective of establishing sustainability for the aquaculture industry by the Government of Canada. Worldwide, aquaculture sustainability reporting is a new activity for industry and governments. DFO has identified a number of aspects or themes of sustainable aquaculture. These themes may serve as an organizational framework for annual reporting. They address key issues that are important both in the public interest and important materially to aquaculture sustainability. The themes include:

- Ensuring Effective and Efficient Governance
- Maintaining Healthy and Productive Ecosystems

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<sup>22</sup> C&P: Finfish Aquaculture Site Inspection Checklist: 2011

- Maintaining Animal Health and Welfare
- Ensuring Food Safety and Traceability
- Using Resources Efficiently
- Encouraging Social Responsibility, and
- Ensuring an Economically Viable and Successful Industry.<sup>23</sup>

As the IMAP-MF develops, Performance Reviews will take place of both broad Management Plans and of Area-Based Operational Plans as they are developed. As these plans are developed, along with specific objectives, evaluation criteria will be set which will help government and stakeholders gauge and assess success or failure in meeting objectives. Criteria will include indicators that will be used to determine if the plan objectives are met. These may include indicators specifically developed for these plans, those outlined in other policies, or information available from other sources.

Performance reviews may include:

- Assessment of the IMAP-MF process;
- Assessment of the IMAP-MF plan;
- Assessment of the effectiveness of the measures implemented (outputs and outcomes);
- Review of decision-rules;
- Assessment of level of success in meeting objectives; and
- Recommendations and suggestions for improvement.

All relevant government department and ministries, First Nations, industry, and other stakeholders working through the Advisory Committee process, should have the opportunity to provide meaningful input into both the Plans and Performance Reviews.

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<sup>23</sup> DFO: Report to Canadians - The Sustainability of Aquaculture in Canada 2011

## Appendix A - Contact Information

Observe, Record and Report (Enforcement Line)

1-800-465-4336

Aquaculture Management Pages

National <http://www.dfo-mpo.gc.ca/aquaculture/aquaculture-eng.htm>

Regional <http://www.pac.dfo-mpo.gc.ca/aquaculture/index-eng.htm>

Aquaculture Management

Port Hardy Office

P.O. Box 10

Port Hardy, B.C., V0N 2P0

Fax: 250-949-6755

Aquaculture Resource Management

Regional Marine Finfish Coordinator – IMAPs Brenda McCorquodale 250-949-6434

Senior Engagement Advisor Todd Johannson

Finfish Officer vacant

Aquaculture Environmental Operations

Senior Finfish Biologist

(marine mammal impacts, escapes) Byron Andres 250-949-6450

Finfish Biologist Erica Grebeldinger 250-949-6456

Campbell River Office

1520 Tamarac Street

Campbell River, B.C., V9W 3M5

Fax: 250-286-5836

Aquaculture Resource Management

Aquaculture Environmental Operations

Senior Finfish Biologist

(Benthic impacts, incidental catch) Kerra Hoyseth 250-286-5831

Finfish Biologist Michelle Charbonneau 250-286-5833

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Finfish Biologist	Krista Lange	250-286-5835
Finfish Biologist	Claire Salvador	250-286-5825
Finfish Biologist	Robyn Pearce	250-286-5826

Courtenay Office

103 – 2435 Mansfield Drive

Courtenay, B.C., V9N 2M2

Fax: 250-703-0921

Aquaculture Environmental Operations

Fish Health Division

Lead Veterinarian	Dr. Mark Sheppard	250-703-0901
Field Operations Veterinarian	Dr. Ian Keith	250-703-0917
Senior Fish Health Biologist	Thom Heiman	250-703-0902
Fish Health Technician	Howie Manchester	250-703-0916
Fish Health Technician	Farzin Khosrow-Khavar	250-703-0929

Nanaimo Office

1965 Island Diesel Way

Nanaimo, B.C., V9S 5W8

Aquaculture Resource Management

Senior Finfish Coordinator – Licencing	Bernie Taekema	250-754-0398
Finfish Officer	Debbie Paltzat	250-754-0393
Senior Freshwater Coordinator – Licencing	Gabrielle Kosmider	250-754-0363
Conservation and Protection Chief (Enforcement Plan)	Brian Atagi	250-754-0367

Fisheries and Oceans Canada Pacific Region Headquarters

201 – 401 Burrard Street

Vancouver, B.C., V6C 3S4

Aquaculture Licensing Referrals

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Aquaculture Referrals Officer Shelley Meadows 604- 666-3354

Science and Ecosystem-Based Approach  
Ecosystem Approach Coordinator Jon Chamberlin 250-363-6301

Pacific Biological Station/ IOS?

Canadian Food Inspection Agency

Environment Canada - Canadian Wildlife Service

Transport Canada

Marine Safety

Navigable Waters

**Environment Canada**

Environmental Protection Branch (Disposal at Sea permits)

Disposal at Sea  
#201-401 Burrard Street  
Vancouver, B.C.  
V6C 3S5

Government of British Columbia

Front Counter B.C. (tenure applications)

Ministry of Natural Resource Operations - Licensing and Tenuring information

2500 Cliffe Avenue, Courtenay, B.C. V9M 5M6.

Phone: (250)897-7540.

Aquaculture Statistical Information: Ministry of Agriculture

2975 Jutland Road Victoria, BC V8T 5J9

fishstats@gov.bc.ca or

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Victoria & Area fax: 953-3401 or Toll free fax: 888-356-0358

**B.C. Salmon Farmers Association**

#302 - 871 Island Highway  
Campbell River, BC V9W 2C2

**Phone:** 250-286-1636

**Fax:** 250-286-1574

**Toll-free:** 1-800-661-7256

Executive Director

Mary Ellen Walling

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**Canadian Aquaculture Industry Alliance**

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Tel: 250-951-9866 (Parksville, BC)

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Executive Director

Ruth Salmon

[ruth.salmon@aquaculture.ca](mailto:ruth.salmon@aquaculture.ca)

## **Appendix B - Marine Finfish Aquaculture Maps**

*Draft for Discussion*