PACIFIC REGION

INTEGRATED MANAGEMENT OF AQUACULTURE PLAN

SHELLFISH

INTERIM

November 29, 2011

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Forward

The purpose of the Integrated Management of Aquaculture Plan for Marine Shellfish (IMAP-SF) is to provide an overview of marine Shellfish 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 Shellfish aquaculture industry.

The IMAP-SF serves to communicate basic information about shellfish culture and its management to Fisheries and Oceans Canada staff, industry, First Nations, stakeholders, and the Canadian public. The IMAP-SF provides an overview of the basic rules and mechanisms for the sustainable management of shellfish 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-SF is not a legally binding instrument which can form the basis of a legal challenge. The IMAP-SF 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-SF 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-SF will be implemented in a manner consistent with these obligations. In the event that an IMAP-SF 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 four main categories including: Marine Finfish, Shellfish, Freshwater, and Enhancement. In addition, science and 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 shellfish aquaculture is concerned with the culture of any marine invertebrate organism (including but not limited to molluscs, crustaceans and echinoderms), grown exclusively in salt water.

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 shellfish aquaculture, in B.C. the output of the process is shellfish for sale for human consumption, at the end of the production cycle.

Planning through the IMAP-SF includes consideration of any part of the life cycle of cultured shellfish. It includes seed production, nursery rearing, and grow-out.

The IMAP-SF follows national direction provided by Fisheries and Oceans Canada within Aquaculture Management: *A Sustainable Aquaculture Fisheries Framework* (SAFF),[1] the *Fishery (General) Regulations*[2], and the *Pacific Aquaculture Regulations*.[3]

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[1] Insert link to the *Sustainable Aquaculture Fisheries Framework*.- when available

[2] *Fishery General Regulations* can be found at http://laws.justice.gc.ca/eng/regulations/SOR-93-53.

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-SF sets out the following:

- sector overview and context
- policy framework
- science
- socio-economic importance of aquaculture
- management issues
- general objectives
- ecosystem-based management measures
- First Nations, industry, and stakeholder commitments
- inspection, compliance, and enforcement plans
- performance review.

DFO will work collaboratively with First Nations, industry, other governments and stakeholders to develop the IMAP-SF and the associated management framework for shellfish aquaculture. The IMAP-SF will move toward incorporating an ecosystem approach, adaptive and area-based management components, as well as incorporating the ongoing engagement of First Nations, industry, and stakeholders.

A companion document, the interim *IMAP-SF Backgrounder (under development)*, has also been developed to provide additional background information relating to the regulation and management of shellfish aquaculture.

Further contact information related to shellfish 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 455 shellfish aquaculture facilities.

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

Cultured marine Shellfish species, types, and techniques for culture

Cultured species

There were 27 species licensed for shellfish aquaculture, as of September 2011 (see table below). It should be noted, however, that not all of these species were, or currently are, in active production.

Oysters: The Pacific oyster is the most widely cultivated shellfish in BC, the Pacific Northwest, and world-wide. The European oyster and Kumamoto oyster, a subspecies of the Pacific oyster, are also farmed provincially in small amounts.

Clams: The Manila clam is the primary product of BC and Canadian clam culture, and one of the most farmed species globally. Lower-value native species of butter clams and littleneck clams are often present on shellfish leases and may be harvested along with Manila clams. The varnish, or savory clam is an invasive species that can be licensed for incidental harvest, but not for culture, on intertidal leases.

Geoduck: Since 1995, the native geoduck clam has been grown at five experimental sites, in order to develop the technology for geoduck culture.

Mussels: The native Western blue mussel and two recent imports, the Eastern blue mussel and Gallo, or Mediterranean mussel, are cultured on a small scale in BC.

Scallops: The main farmed species is a hybrid of the Japanese scallop and the native weathervane scallop, known as the Pacific or Qualicum Beach scallop. The giant rock scallop and pink scallop have also been grown experimentally.

Other Species: New shellfish species are being explored for culture because of their potential high value in international markets and/or significance as traditional food for First Nations. These include red and green sea urchin, spot prawn, California sea cucumber, and Nutall's cockle.

Different types of shellfish culture may be used, depending on the species, life stage, site characteristics, and other factors. The following provides a summary of the broad categories of shellfish culture, the phases of production, and key technologies used.

Common Name	Latin Name	Culture Type
Butter Clam	*Saxidomus giganteus*	Intertidal
California Sea Cucumber	*Parastichopus Californicus*	Subtidal bottom and container
Dungeness Crab	*Cancer magister*	
Eastern Blue Mussel	*Mytilus edulis*	Suspended
Eastern Oyster	*Crassostrea viginica*	Intertidal and suspended
European Oyster	*Ostrea edulis*	Intertidal
Gallo Mussel	*Mytilus galloprovincialis*	Suspended
Geoduck Clam	*Panope abupta*	Intertidal and subtidal bottom, suspended container
Giant Rock Scallop	*Crassadoma gigantea*	Suspended
Green Sea Urchin	*Strongylocentrotus droebachiensis*	Suspended, container
Horse Clam	*Tresus capax*	Intertidal
Japanese Scallop	*Patinopecten yessoensis*	Suspended
Pacific Scallop Hybrid	*P. caurinus x yessoensis*	Suspended
Kumamoto Oyster	*Crassostrea sikamea*	Suspended
Littleneck Clam	*Protothaca staminea*	Intertidal
Manila Clam	*Tapes philippinarum*	Intertidal bottom
Nutall's Cockle	*Clinocardium nuttalli*	Intertidal, subtidal bottom
Olympia Oyster	*Ostrea conchaphila*	Intertidal, subtidal bottom, suspended
Pacific Oyster	*Crassostrea gigas*	Intertidal, subtidal bottom, suspended

Common Name	Latin Name	Culture Type
Pink Scallop	*Chlamys rubida*	Suspended
Purple Sea Urchin	*Strongylocentrotus purpuratus*	Suspended
Red Sea Urchin	*Strongylocentrotus franciscanis*	Suspended
Spiny Scallop	*Chlamys hastata*	Suspended
Spot Prawn	*Pandalus platyceros*	
Varnish Clam	*Nuttalia obscurata*	Intertidal bottom
Weathervane Scallop	*Patinopecten caurinus*	Suspended
Western Blue Mussel	*Mytilus trossulus*	Suspended

Shellfish Species Licensed for Aquaculture in BC, September 2011

Types

Intertidal Culture

Intertidal systems comprise both bottom (beach) culture, where shellfish are directly planted in the substrate, and near-bottom (epibenthic) culture, where they are suspended over the substrate by means of racks, bags, and other equipment. The latter approach is often used when substrate conditions are unsuitable (e.g., soft mud or silt). Oysters may be farmed in the intertidal zone, including their nursery rearing on shell cultch before grow-out in deeper water. Clams are only grown intertidally.

Subtidal Bottom Culture

Geoduck, as an example, can be bottom cultured in subtidal, or intertidal areas. In subtidal systems, geoduck seed are raised to a certain size and then are transferred onto the seabed using an underwater mechanical seeder. In intertidal systems, smaller seed are planted in tubes that are buried in the substrate. This method is, generally, not appropriate for subtidal areas, where currents can cause the tubes to shift.

Suspended or Deepwater Culture

Increasingly, oyster, and other bivalve culture has been moving to off-bottom systems that are highly efficient and productive. These systems use floating rafts, buoys, and longlines to suspend the shellfish above the ocean floor. Deepwater oysters can grow up to three times as fast as intertidal oysters, although they are typically moved to the beach for defouling and hardening prior to sale. In BC, all mussel and scallop farming is suspended.

Techniques

Seed Production

Shellfish culture begins with the production of seed (spat). While some oyster spat is collected in the wild, the trend is towards greater production in hatcheries, from broodstock. All clam, mussel, and scallop spat in the province are hatchery-sourced. Growers can acquire their seed pre-set (e.g., on cultched shell, or in tubes), or can set larvae on site in tanks, with seed collectors. Seed are usually acquired in the spring or early summer, to maximize growth.

Nursery Rearing

Once set, the seed are moved to nursery rearing systems designed to protect juveniles from fouling, disease, and predation. These systems can be intertidal, deepwater, land-based, or floating with seawater flow-through (upwellers and downwellers).

Grow-out

When seed have reached a minimum size, they are transferred for final grow-out in intertidal, subtidal, or deepwater areas. Depending on the circumstances, a variety of grow-out methods may be adopted, including beach planting, near-bottom bags and cages, and trays and ropes suspended from longlines or rafts. Key issues for grow-out include controlling the impacts of predators, siltation, and rough water conditions.

Harvesting

Mature shellfish are harvested by both manual and mechanized means. Intertidal clams and oysters, as well as geoduck are still, largely, hand harvested (e.g., with rakes, wands), although mechanical harvesters are under development. A number of BC oyster farmers have developed their own harvesting machines for suspended culture, using equipment such as hydraulic hoists and winches.

Storage and Handling

Before being shipped for processing, shellfish may be temporarily stored on site. Wet storage can take place in intertidal areas using mesh bags or pouches and in deepwater utilizing nets, bags, or sink floats. Mussel growers may also wash and declump their product prior to shipping. All bivalve shellfish are required by law to be landed at a federally regulated processing plant.

Containment and Suspension Techniques

Various equipment are used for containing shellfish during the nursery rearing and grow-out phases, including mesh bags and cages, trays, tubes and string, socks, and lantern nets. These may be hung from rafts or longlines or laid on or anchored to the substrate.

Longlines are an efficient suspension method for a range of culture species, and tend to be more stable than rafts in rough water. Rafts are not suitable for scallop farming due to

their motion sensitivity and lower stocking densities. Sink floats provide wet storage and may also be used in harvesting mussels suspended from rafts.

Industry Structure

BC shellfish culture is a small industry composed of about 300 producers. Shellfish farms are typically small family-run or "lifestyle" businesses, although in recent years some new entrepreneurial companies have entered the industry.

Unlike finfish culture, there is limited vertical integration. The majority of shellfish producers are growers only, selling their output to processors (also growers) for final production (cleaning, grading, shucking, packing, etc.) and marketing.[4] There are in the order of 40 provincial companies processing shellfish products, a quarter of which sell internationally. Most shellfish processors are smaller operations that supply local markets.

Locations

Shellfish farming occurs primarily on the West Coast of Vancouver Island and around the Georgia Basin. Production is concentrated in Baynes Sound, Cortes Island, and Okeover Inlet.

Outside these regions, there are only a few farms in commercial operation, near Haida Gwaii and Prince Rupert.

The industry occupies a comparatively small coastal land base. With approximately 3,300 hectares in licensed shellfish tenures, the average farm size is less than 7 hectares and many farms are two hectares or less. Of the province's approximately 500 shellfish tenures, about half are deepwater leases.[5]

Management Approaches

Shellfish 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 shellfish aquaculture is regulated. Shellfish aquaculture is a complicated field with numerous governmental jurisdictions engaged. In order to help provide further detail, an *IMAP-SF Backgrounder (under development)* has been developed to provide specific information related to the mechanisms and management approaches taken with respect to the various aspects of shellfish 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

[4] According to Statistics Canada's industry classifications, aquaculture includes hatcheries and grow-out facilities, but processing belongs to a separate industry.

[5] From the Vancouver Island University – Centre for Shellfish Research website: http://www.viu.ca/csr/industry/industrybackground.asp

management of aquaculture are outlined in the *IMAP-SF Backgrounder (under development)*.

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 shellfish aquaculture industry, including links to key policies and approaches, is outlined in the *IMAP-SF Backgrounder (under development).*

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. Under the *Fisheries Act*, DFO is the lead federal agency responsible for managing aquatic resources including aquaculture. The department is also responsible for managing wild and enhanced fish stocks and their habitat. DFO works to actively manage these interests.

Within DFO, the Aquaculture Management Directorate (AMD) is the focal point for the department's aquaculture related policies and activities. The AMD regional 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 shellfish aquaculture are authorized under the shellfish aquaculture Conditions of Licence.[6] 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, which 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-SF Backgrounder (under development)*, 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

[6] Shellfish Conditions of Licence are available online at the following link: http://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/shell-coq-eng.htm .

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 to instruments, processes, and institutions. The FAO distinguishes between **policy** (high level governance) and **management** (medium to low level governance).[7]

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 through the B.C. Treaty process. Some of these have specific clauses which relate to shellfish 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 shellfish 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 shellfish aquaculture industry, to support the best possible outcomes for the industry, the environment, and Canadians.

[7] Available on the FAO website at: http://www.fao.org/fishery/topic/12271/en

Advisory Committees

The IMAP process is intended to be a key feature institutionalized in the conduct of the British Columbia Aquaculture Regulatory Program through, among other things, a formal advisory process.

IMAP is a planning process 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.

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 shellfish 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 and the Pacific Integrated Commercial Fisheries Initiative, Co-Management 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 (DFO) has committed to developing an explicit policy framework in support of transparent delivery of its new responsibilities. Work on the *Sustainable Aquaculture Fisheries Framework* (SAFF) is underway and is intended to reflect the areas where policy direction is expected to be required to implement the BC Aquaculture Regulatory Program (BCARP), and will largely parallel the *Sustainable Fisheries Framework* (SFF), adapting SFF approaches to reflect aquaculture requirements.

DFO is already managing the aquaculture sector , as of December 2010, and 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, and 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.

DFO is developing specific policies and approaches in accordance with these SAFF categories. A number of policies have been released or will shortly be released, and the balance will be developed by the DFO. The relative priority of the various SAFF policies may be a matter for consideration through the IMAP development process.

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 impacts to 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 – C&P Status
- First Nations Engagement Policy
- National Policy on Access to Aquatic Resources including Fish and Space (update)
- 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 Shellfish, 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.*[8]

[8] 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.

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).[9]

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.[10]

Aquaculture Pathways of Effects (2009)

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.[11]

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.[12]

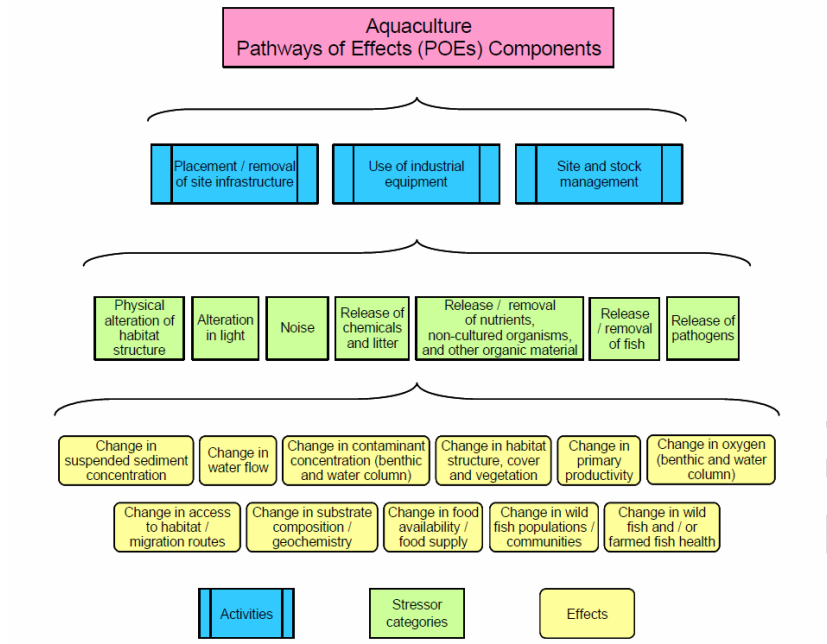
The Department recognizes the importance of research on aquaculture-environmental interactions (and broader marine ecosystem and fisheries issues) that is conducted by individuals and institutions (e.g. Universities, ENGOs, private consultants, First Nations). The reports and publications resulting from 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.

[9] The *State of Knowledge Initiative* is available online here: http://www.dfo-mpo.gc.ca/science/enviro/aquaculture/index-eng.htm .

[10] *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/2006/SAR-AS2006_005_E.pdf

[11] *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

[12] The CSAS website is online here: http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.



Aquaculture Pathways of Effects Components

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 concensus 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.

The Department currently has three major funding initiatives that provide support for aquaculture research, development and commercialization across the country:

Program for Aquaculture Regulatory Research (PARR)[13]

Aquaculture Collaborative Research and Development Program (ACRDP)[14]

Aquaculture Innovation and Market Access Program (AIMAP).[15]

[13] More information is available online here: http://www.dfo-mpo.gc.ca/science/enviro/aquaculture/parr-prra/index-eng.asp

[14] More information is available online here: http://www.dfo-mpo.gc.ca/science/enviro/aquaculture/acrdp-pcrda/index-eng.htm

[15] More information is available online here: http://www.dfo-mpo.gc.ca/aquaculture/sustainable-durable/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 polices, 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

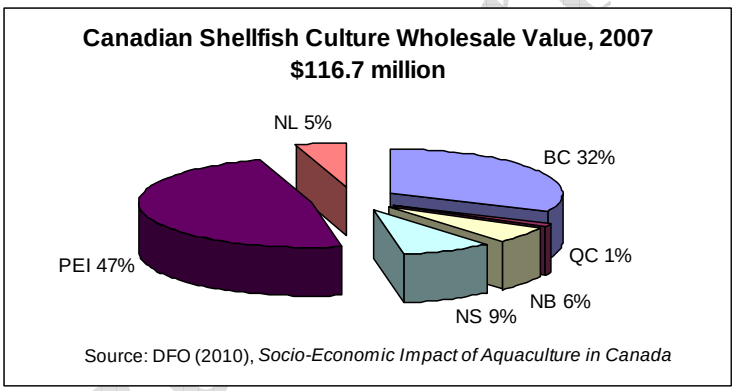
DFO plans to facilitate dialogue between governments, industry, First Nations and local communities, both bilaterally and through the establishment of area-based planning initiatives, to integrate traditional and local knowledge into both planning and management of shellfish aquaculture and the development 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

Cultured shellfish production in BC has grown considerably over the past two decades, rising from 4,000 tonnes in 1990, to more than 7,000 tonnes in 2008. The farmgate value of output has increased by roughly five times, from $3 million to $16 million, with the effect of strengthening markets and higher prices.



Today, BC is the second largest producer of farmed shellfish in Canada, after Prince Edward Island with its concentration of blue mussel culture. Almost one-third of the country's final product (wholesale) value is generated on the West Coast.[16] BC is also the largest Canadian producer of clams, oysters, and scallops.[17]

Among BC's cultured species, oysters account for the largest shares of total harvest (about 74%) and wholesale value (around half), followed by clams. At the farm gate, however, clams make up the largest value share (about 41%). This difference reflects the greater degree of processing for a major share of oyster production.[18]

[16] Wholesale value equals the farmgate value plus value-added from basic processing of the shellfish.

[17] From "Socio-Economic Impact of Aquaculture in Canada" (2010) found at: http://www.dfo-mpo.gc.ca/aquaculture/ref/aqua-es2009-eng.pdf.

[18] About half of BC oysters are shucked and packed into containers, which is a labour-intensive process.

BC Cultured Shellfish Production

	Harvest ('000 tonnes)		Landed Value ($ million)		Wholesale Value ($ million)	
	2008	2009	2008	2009	2008	2009
Clams	1.3	1.2	7.2	6.8	9.8	10.0
Oysters	5.6	5.4	6.5	6.5	13.2	14.0
Scallops & Other	0.6	0.7	2.5	3.1	5.2	5.9
Total	7.5	7.3	16.2	16.4	28.2	29.9

Source: BC Ministry of Environment, 2009 BC Seafood Industry Year in Review,[19]

Despite its growth, cultured shellfish still only accounts for 3% of BC's total seafood harvest and 8% of marine aquaculture production. Shellfish culture has made some gains relative to the wild fishery (e.g., in clam production), but the wild harvest remains dominant, with approximately 70% of total shellfish output in the province.

Employment

The BC shellfish culture industry is responsible for in the order of 1,000 direct jobs. This total includes both full-time and part-time workers. A 2003 survey of provincial aquaculture employment reported 800 jobs in shellfish culture and 1,600 jobs in finfish, including associated hatcheries.[20] On a full-time equivalent basis, shellfish culture was estimated to generate 320 person-years (PYs) of direct employment and finfish 1,410 PYs.[21]

Compared to other resource-based industries, including salmon aquaculture, shellfish farming is labour-intensive. While employment in aquaculture as a whole tends to be year-round compared to other sectors (e.g., the wild fishery), shellfish culture generally

[19] "BC Ministry of Environment, 2009 BC Seafood Industry Year in Review" is found at: http://www.env.gov.bc.ca/omfd/reports/YIR-2009.pdf.

[20] By way of comparison, there is roughly the same number of jobs (in the order of 2,000) in the commercial fishery as in finfish and shellfish aquaculture. See BC Stats (2007), *British Columbia's Fisheries and Aquaculture Sector.*

[21] These FTE estimates are based on assumed labour intensities of 36.5 PY per 1,000 tonnes of production for shellfish and 16.5 PY per 1,000 tonnes for marine finfish. See http://www.env.gov.bc.ca/omfd/fishstats/aqua/employ-03.html.

has more seasonal workers than finfish culture. Roughly half of all aquaculture jobs are held by workers under the age of thirty.

In addition to direct employment, there are approximately 600 jobs associated with industries that supply and service BC shellfish culture.[22] The vast majority of direct and indirect jobs are located in rural, coastal, and First Nations communities. Since these areas have been most hard hit by the by the downturn in forestry and fishing, aquaculture can play a role in revitalizing economic development and keeping youth in their communities.

Shellfish farming is already a major employer in the Baynes Sound and Cortes Island/Okeover Inlet areas. Salmon and shellfish aquaculture together account for almost 10% of total employment in the province's Comox-Strathcona Region.[23]

Markets and Prices

BC shellfish culture is export-oriented, with more than three-quarters of farmed clams and oysters going to foreign markets, primarily on the US West Coast. Shellfish markets tend to be regional in scope due to the high unit transportation costs and challenges shipping a live product. However, higher-value species, such as geoduck, are sold to China and Japan.

Globally, aquaculture production has continued to demonstrate strong growth, increasing at an average 7 percent annually between 2002 and 2007.[24] According to the UN Food and Agriculture Organization (FAO), production by the world's capture fisheries has peaked, so that new fish supply is expected to come from farmed sources. Currently comprising about 35% of all fish production (tonnes), aquaculture could meet more than half of global fish requirements by 2030.[25]

BC is only a minor player on the world stage. Canada ranks 25th in aquaculture production (tonnes) and accounts for 0.3% of global output. Provincial shellfish producers face stiff regional competition from the US Pacific Northwest and globally from countries such as China, Chile, Mexico, and New Zealand. Washington State's industry, for example, is around six times the size of BC's.

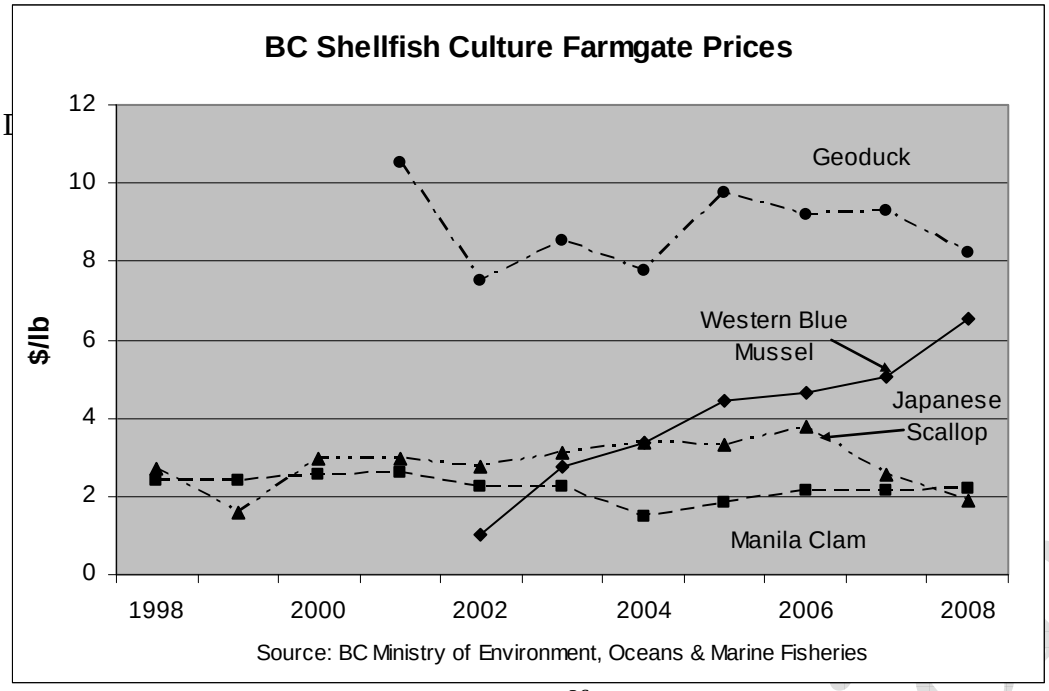
Shellfish prices vary significantly by species, as indicated in the figure below. Higher values are being received for some of the more recently cultured species, including geoduck. Over the past decade, prices have been relatively flat for the main culture

[22] From the Vancouver Island University – Centre for Shellfish Research website: http://www.viu.ca/csr/industry/industrybackground.asp

[23] Gardner-Pinfold Consulting Economists Ltd. (2010), *Socio-Economic Impact of Aquaculture in Canada.*

[24] FAO (2009), *FAO Yearbook of Fishery and Aquaculture Statistics 2007.*

[25] Aquaculture has a higher share (47%) of food fish production, which excludes non-food uses of fish. It also accounts for a higher share (65%) of world mollusc production. FAO (2009), *The State of World Fisheries and Aquaculture 2008*.



species of Pacific oysters and Manila clams.[26] This reflects the commodity nature of these products, in particular oysters which sell into highly competitive US markets.

Because of the reliance on export sales, pricing is sensitive to exchange rate fluctuations. Recently, the prices and production values for cultured shellfish have declined due to the appreciation of the Canadian dollar against the US dollar, which has seriously eroded profit margins for BC producers.

Social and Cultural Linkages

Local communities and First Nations in British Columbia may have unique and specific perspectives on shellfish aquaculture. Through the IMAP-SF 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 shellfish 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 shellfish aquaculture. Priority management issues will be

[26] Pacific oysters are not shown in the graphic because data are not complete for farmgate prices expressed in dollars per unit weight. Prices are typically in $/US gallon for shucking oysters and in $/dozen for in-shell product. Over the seven years since 1998 for which data were available, the average price of Pacific oysters was under $3/lb.

selected and scoped as a part of IMAP-SF 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.
- 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 - elements which are under the regulatory jurisdiction of DFO, under the Canadian Shellfish Sanitation Program[27]

Through consultation related to the IMAP-SF 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

[27] More information on the Canadian Shellfish Sanitation Program can be found at: http://www.inspection.gc.ca/english/fssa/fispoi/csspccsme.shtml

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.

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 shellfish 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-SF 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 shellfish 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-SF 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 shellfish 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 shellfish aquaculture is collected, both, through reporting required under the Conditions of Licence, and through site visits conducted by the Department. A *Public Reporting Policy*[28] 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 shellfish is available on the DFO public website.[29] All information that is publically released requires translation, and will be available in both official languages.

Compliance and Enforcement

Shellfish 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.

With respect to federal areas of responsibility, Fisheries and Oceans Canada is the main agency dealing with compliance and enforcement issues.

DFO has set out a general approach within the *British Columbia Aquaculture Compliance & Enforcement Strategy*.[30] 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 (available on the internet[31]) 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:

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[28] Insert reference once Policy is approved and posted.

[29] Public reporting information is available here: http://www.pac.dfo-mpo.gc.ca/aquaculture/reporting-rapports/index-eng.htm .

[30] This report can be found on-line: will be updated once posted.

[31] The shellfish aquaculture Conditions of Licence are available here: http://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/shell-coq-eng.htm .

- 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:

- 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 Shellfish Aquaculture Site Inspection Checklist (under development);
- Auditing of management plans; and
- Reporting/ analysis and follow up.

A national *Aquaculture Compliance and Enforcement Strategy* is currently under development by Fisheries and Oceans Canada, based on guidance provided through: the *National Compliance Framework*; the *Framework for Aquaculture Environmental Management*; and the *Compliance and Enforcement Policy for the Habitat Protection and Protection Prevention* Provision of the *Fisheries Act*.

Over time, baseline compliance information will be generated and tracked from year to year, in order to provide ongoing management information related to the shellfish

industry as a whole. Annual C&P operational plans will incorporate the possible impacts of aquaculture activities; compliance factors (risks). 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 shellfish aquaculture. The IMAP-SF 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
- Maintaining Animal Health and Welfare
- Ensuring Food Safety and Traceability
- Using Resources Efficiently
- Encouraging Social Responsibility, and
- Ensuring an Economically Viable and Successful Industry.[32]

As the IMAP-SF 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-SF process;
- Assessment of the IMAP-SF plan;
- Assessment of the effectiveness of the measures implemented (outputs and outcomes);
- Review of the decision rules;

[32] DFO: Report to Canadians - The Sustainability of Aquaculture in Canada 2011

- 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.

Appendix A - Contact Information

DFO Shellfish Aquaculture E-Mail: Shellfish.Aquaculture@dfo-mpo.gc.ca

Observe, Record and Report (Enforcement Line) 1-800-465-4336

DFO 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

Fisheries and Oceans Canada Pacific Region Headquarters

201 – 401 Burrard Street

Vancouver, B.C., V6C 3S4

Aquaculture.Licensing@dfo-mpo.gc.ca

Aquaculture Licensing Referrals:

Aquaculture Referrals Officer - Shelley Meadows – (604) 666-3354

Science and Ecosystem-Based Approach:

Ecosystem Approach Coordinator - Jon Chamberlain – (250) 363-6301

Nanaimo Office

1965 Island Diesel Way

Nanaimo, B.C., V9S 5W8

Aquaculture Resource Management:

Senior Shellfish Coordinator – Kerry Marcus - (250) 754-0210

Shellfish Coordinator – Tricia Spearing – (250) 754 – 0407

Shellfish IMAP Coordinator – Gabrielle Kosmider – (250) 754 – 0404

Conservation and Protection:

Area Chief, Aquaculture - Brian Atagi - (250) 754-0367

Courtenay Office

103 – 2435 Mansfield Drive

Courtenay, B.C., V9N 2M2

Aquaculture Environmental Operations:

Senior Shellfish Biologist – Shelley Jepps – (250) 949-6450

Shellfish Biologist – Debra Hughes– (250) 703-0915

Shellfish Biologist – Scott Pilcher – (250) 703-0906

Shellfish Biologist – Steven Schut – (250) 703-0920

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

Port Hardy Office

P.O. Box 10

Port Hardy, B.C., V0N 2P0

Aquaculture Resource Management:

Senior Engagement Advisor - Todd Johannson - (250) 902-2683

Front Counter B.C. (Harmonized Applications)

http://www.frontcounterbc.gov.bc.ca/contact/

FrontCounter BC toll free at: 1-877-855-3222
Call from outside North America at: ++1-604-586-4400

Introductions and Transfers

famitc@dfo-mpo.gc.ca

Senior Officer – Governance – Cindy Wong - (604) 666-6831

Ministry of Natural Resource Operations - Tenure Information

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

Phone: (250) 897-7540.

Aquaculture Statistical Information: Fisheries and Oceans Canada

fishstats@dfo-mpo.gc.ca

Environment Canada
Environmental Protection Branch (Disposal at Sea permits)

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

Canadian Food Inspection Agency – Parksville Office

457 Stanford Avenue East

Parksville, BC, V9P 1V7

Phone: (250) 248-4772

Fax: (250) 248-6776

Transport Canada - Navigable Waters Protection Program and Marine Safety

Transport Canada
Pacific Regional Office
820-800 Burrard Street
Vancouver, BC
V6Z 2J8

Phone: 604-775-8867
Fax: 604-775-8828

Website: http://www.tc.gc.ca/eng/pacific/menu.htm

B.C. Shellfish Growers Association

www.bcsga.ca

Roberta Stevenson, Executive Director - roberta@bcsga.ca
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Fax: 613-239-0619

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