PACIFIC REGION

SHELLFISH

INTEGRATED MANAGEMENT OF AQUACULTURE PLAN

April 2017 - Version 2.1

Fisheries and Oceans Canada | Pêches et Océans Canada

Canada

This Management Plan is intended for general purposes only.
Where there is a discrepancy between the Management Plan and the regulations, the regulations are the final authority.

FOREWORD

The purpose of the shellfish Integrated Management of Aquaculture Plan (SF-IMAP) is to identify the main objectives and requirements for the management of shellfish aquaculture in British Columbia, as well as the management measures that will be used to meet these objectives. This document provides federal and provincial agencies, local government, industry, First Nations, stakeholders, and the public with an overview of shellfish aquaculture operations in British Columbia and how the industry is managed by Fisheries and Oceans Canada.

The SF-IMAP will be reviewed periodically to incorporate changes in the management approach and to ensure that it includes the most current information available in relation to science, policy, and management practices.

The SF-IMAP is not a legally binding instrument which can form the basis of a legal challenge. The SF-IMAP can be modified at any time and does not fetter the discretionary powers of the Minister of Fisheries and Oceans as set out in the *Fisheries Act, Species at Risk Act,* and the *Oceans Act;* as well as the *Fishery (General) Regulations*, the *Aquaculture Activity Regulations*, 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 SF-IMAP in accordance with the powers granted pursuant to the *Fisheries Act,* the *Oceans Act, or the Species at Risk Act* and supporting regulations.

Where Fisheries and Oceans Canada is responsible for implementing obligations under land claim agreements, the SF-IMAP will be implemented in a manner consistent with these obligations. In the event that an SF-IMAP is inconsistent with obligations under land claims agreements, the provisions of the land claims agreements will prevail to the extent of the inconsistency.

Please note that attempts are made to keep the internet-based links provided in this paper up to date, however providers do change their web addresses regularly and inevitably the reader will find some links no longer work. Please report broken links to AquacultureIMAP.XPAC@dfo-mpo.gc.ca**.**

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DEPARTMENTAL CONTACTS

Aquaculture Resource Management

Regional Manager	March Klaver	250-754-0334
Senior Aquaculture Mgmt Coord. - IMAPs	Brenda McCorquodale	250-949-6434
Senior Aquaculture Mgmt Coord. - Shellfish	Gabrielle Kosmider	250-754-0404
Senior Aquaculture Mgmt Coord. - First Nations	Todd Johansson	250-902-2683

Aquaculture Environmental Operations

Regional Manager	Adrienne Paylor	250-286-5817

Aquaculture Programs

Regional Manager	Lauren Lavigne	604-658-8379
Introductions and Transfers Coordinator	AJ Fenton	604-666-5519

Conservation and Protection

A/Chief	Linda Higgins	250-754-0221
Detachment Supervisor	Joe Knight	250-286-5816

BC Aquaculture Resource Management Program

A/Director	Corey Jackson	604-666-7009

Reporting Violations Observe, Record and Report (Enforcement Line)

1-800-465-4336

1. BACKGROUND AND OVERVIEW OF THE SECTOR

1.1 Background

In December 2010, the Government of Canada assumed primary responsibility for the regulation and management of aquaculture in British Columbia (BC). As the lead federal agency, Fisheries and Oceans Canada (DFO, the Department) is responsible for regulating, monitoring and licensing all shellfish aquaculture operations in the province.

In order to carry out these responsibilities, the *Pacific Aquaculture Regulations* (http://laws-lois.justice.gc.ca/eng/regulations/SOR-2010-270/) and the *Aquaculture Activity Regulations* (http://laws-lois.justice.gc.ca/PDF/SOR-2015-177.pdf) were developed under the *Fisheries Act* to govern the management and regulation of the aquaculture industry in BC. The Department also established the British Columbia Aquaculture Regulatory Program (BCARP) to support implementation of the regulations and day-to-day management of the sector.

While the DFO is the lead federal authority, other federal departments and provincial agencies also have roles in the managing and regulating various aspects of aquaculture in BC. For example, Transport Canada is responsible for reviewing applications with respect to the protection of navigable waters and the Canadian Food Inspection Agency has jurisdiction related to aspects of shellfish sanitation, fish health and processing.

The Province of British Columbia remains responsible for authorizing the occupation of provincial aquatic Crown land associated with aquaculture operations. Aquatic Crown land refers to land below the visible high tide water mark of a body of water, extending offshore to the recognized limit of provincial jurisdiction, including the foreshore. In some cases zoning, administered by local governments, also applies in marine and foreshore areas.

Under the *Pacific Aquaculture Regulations* aquaculture is defined as "the cultivation of fish." The shellfish Integrated Management of Aquaculture Plan (SF-IMAP) is concerned with the cultivation of any shellfish within a marine environment, including the foreshore, intertidal, and deep water (suspended or on the ocean floor) areas. Shellfish are considered cultivated when there is human intervention in the rearing process to enhance production, such as regular seeding or stocking, feeding, or protection from predators. Cultivation also implies individual or corporate ownership, control, and responsibility for the stock being cultivated. The shellfish IMAP includes aspects related to the culture of molluscs, crustaceans, and echinoderms, but not algae or marine plants.

The SF-IMAP outlines the management framework for shellfish aquaculture in BC within marine waters. In some cases the process of culturing shellfish throughout a life cycle may fall under more than one IMAP (e.g. shellfish and freshwater/land-based). This includes the situation where shellfish may be spawned and reared for some time in land-based hatcheries prior to being transferred to the marine environment at some stage of their life cycle.

Consistent with DFO's management of other fisheries, the Department has established advisory processes to support the development of IMAPs, as well as broaden engagement with First Nations, industry and stakeholders regarding the management of aquaculture in BC. The Shellfish Aquaculture Management Advisory Committee (SF-AMAC) is comprised of First Nations, shellfish aquaculture licence-holders, industry associations, environmental interests and local government. DFO and the Province of British Columbia are ex-officio participants in the

advisory process. The Terms of Reference for the SF-AMAC, along with contact information and a schedule of meetings, are available on the DFO Pacific Region consultations webpage (http://www.pac.dfo-mpo.gc.ca/consultation/index-eng.html). More information is available in Section 2.8 of this document.

The SF-AMAC reviews the SF-IMAP and provides advice and recommendations to DFO with respect to the management of shellfish aquaculture in BC. In addition to the SF-AMAC process, the Department consults directly with a range of various interests and sectors. DFO also undertakes bilateral consultation with First Nations and works with organizations such as the First Nations Fisheries Council and others to engage First Nations in the management of aquaculture in BC.

1.2 Sector Overview

The shellfish aquaculture sector has a long history in BC. Shellfish aquaculture sites span the geography of BC's coast and include a variety of species and culture methods. The shellfish aquaculture industry provides employment and offers a variety of economic opportunities ranging from smaller, family-owned operations to larger, corporate entities with diverse production and processing capacity. Many coastal First Nations engage in the shellfish aquaculture industry.

1.2.1 Background and Sector History

Marine species have been cultivated in BC for many years. For example, there is evidence related to the historical use of clam beds by First Nations dating back thousands of years.

In BC the origins of commercial shellfish aquaculture date back to the introduction of the Pacific oyster from Asia in 1912. The organized importation of oyster seed began during the early 1930s, with these oysters becoming established in areas such as Ladysmith Harbour and Pendrell Sound. While the first commercial oyster farms appeared around this time, it was not until the 1950s when a true "industry" developed, including the local collection of wild seed/spat.

Manila clams were inadvertently introduced to the province along with oyster seed in the 1930s. These clams spread quickly in the wild; however, focused cultivation of manila clams did not begin until the mid-1980s with the increase in market demand and improvements in culture techniques.

DFO and the Province of BC approved the introduction of the Japanese scallop in the 1980s. Since then, other species of scallops, clams, oysters, mussels, and more recently, geoduck clams have joined the list of species cultivated on a commercial basis in BC.

1.2.2 Industry Structure

The shellfish aquaculture industry in BC is comprised of almost 300 producers. The industry is diverse, made up of both small businesses, including sole proprietorships, and larger integrated companies.

The majority of shellfish aquaculture licensees focus on the grow-out phase of the aquaculture cycle. Many purchase seed/spat from hatcheries, while some cultivate naturally settling spat. Animals are grown to a marketable size and sent to processors for final production (cleaning,

grading, shucking, packing, etc.) and marketing.[1] There are approximately 40 companies currently processing shellfish products, a quarter of which sell internationally. Most shellfish processors are small operations that supply local markets.

1.2.3 Current Status of Licences and Locations

DFO currently licenses approximately 456 shellfish aquaculture facilities (2016) with the approximate production by species, as follows:

Shellfish production by species and weight (in tonnes) – 2009 - 2015

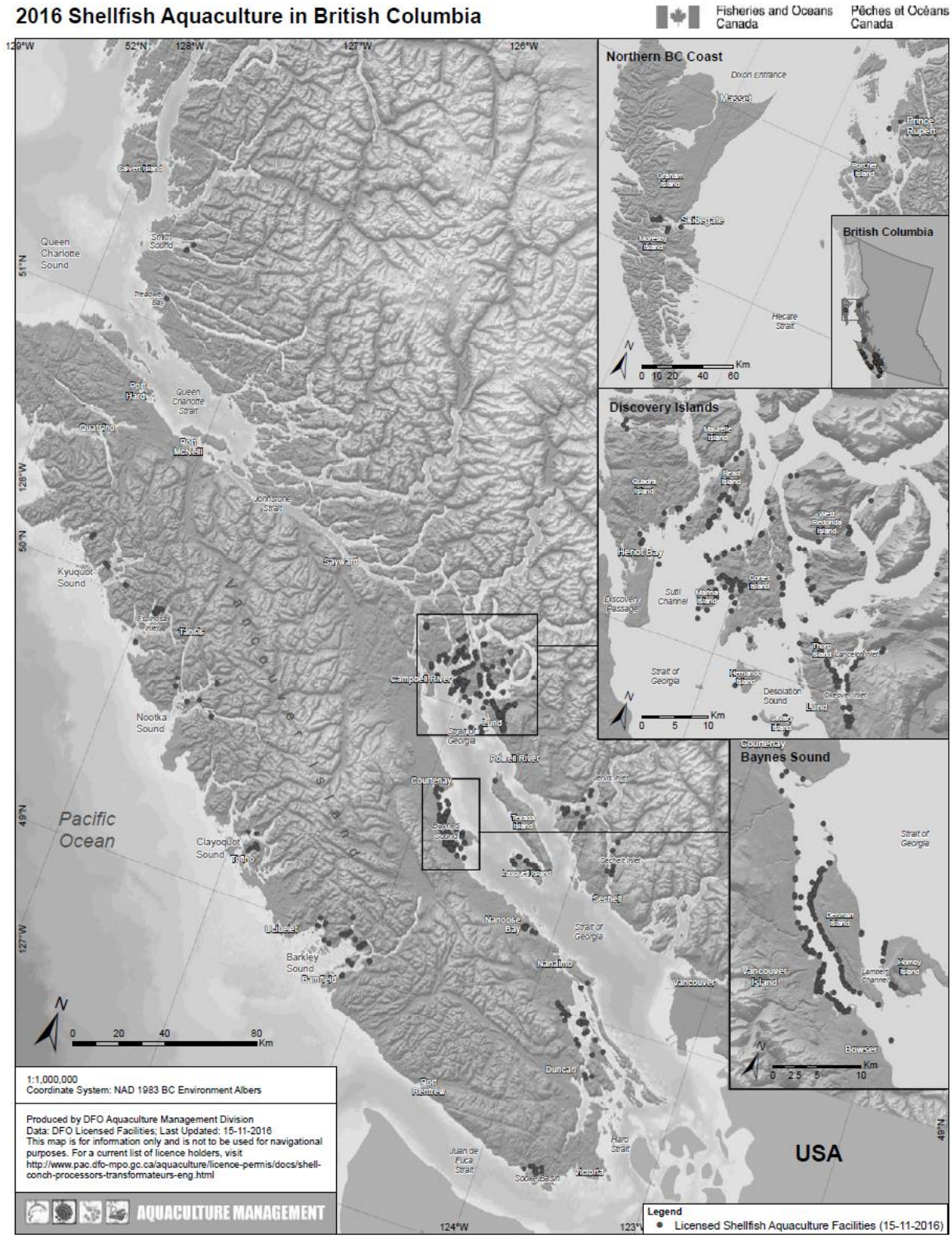
	Production (in tonnes)						
Species	2009	2010	2011	2012	2013	2014	2015
Clams	1,359	1,485	1,262	1,243	1,164	1,309	1,260
Oysters	5,735	7,550	7,320	7,168	6,737	7,840	6,587
Mussels	312	364	294	274	352	596	668
Scallops	385	695	271	201	92	99	20
Other Shellfish	530	26	0	Na	Na		0
TOTALS:	8,321	10,120	9,152	8,893	8,269	11858	10550

Na – data is confidential – less than three companies reporting harvests.

Shellfish aquaculture is generally concentrated in areas around the southern coast of BC, including the west coast of Vancouver Island and the Georgia Basin (particularly Baynes Sound, Cortes Island, and Okeover Inlet). There are also a small number of farms located in the Central Coast, near Haida Gwaii and Prince Rupert.

Altogether, the shellfish aquaculture industry occupies approximately 3,800 hectares in BC. The average shellfish aquaculture facility occupies less than nine hectares and many farms are two hectares or less. Of the approximately 450 shellfish tenures in BC, about half are licensed for deepwater culture activities. A list of all current shellfish aquaculture licence-holders is available on the DFO website: http://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/shell-coq-eng.html.

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


2016 Shellfish Aquaculture in British Columbia
Fisheries and Oceans Canada
Pêches et Océans Canada
Northern BC Coast
Dixon Entrance
Masset
Prince Rupert
Porcher Island
Graham Island
Skidegate
Moresby Island
Hecate Strait
British Columbia
Discovery Islands
Maurelle Island
Read Island
Quadra Island
West Redonda Island
Heriot Bay
Cortes Island
Discovery Passage
Sutil Channel
Marina Island
Thormanby Islands
Jervis Inlet
Strait of Georgia
Redonda Island
Desolation Sound
Lund
Courtenay
Baynes Sound
Denman Island
Hornby Island
Vancouver Island
Lambert Channel
Bowser
Campbell River
Powell River
Texada Island
Sechelt Inlet
Sechelt
Nanoose Bay
Nanaimo
Vancouver
Duncan
Port Renfrew
Juan de Fuca Strait
Haro Strait
Victoria
Sooke Basin
USA
Pacific Ocean
Queen Charlotte Sound
Hecate Strait
Dixon Entrance
Calvert Island
Smith Sound
Meadows Bay
Port Hardy
Queen Charlotte Strait
Quatsino
Port McNeill
Johnstone Strait
Kyuquot Sound
Sayward
Esperanza Inlet
Tahsis
Nootka Sound
Clayoquot Sound
Tofino
Ucluelet
Barkley Sound
Bamfield
Port Alberni
Quadra Island
Cortes Island
Lasqueti Island
Gabriola Island
Denman Island
Hornby Island
Vancouver Island
Lambert Channel
Thormanby Islands
Redonda Island
Jervis Inlet
Sechelt Inlet
Nanoose Bay
Strait of Georgia
Haro Strait
Juan de Fuca Strait
Sooke Basin
Victoria
Duncan
Nanaimo
Vancouver
Port Renfrew
Bowser
Courtenay
Baynes Sound
Powell River
Campbell River
Lund
Tahsis
Nootka Sound
Kyuquot Sound
Sayward
Johnstone Strait
Port McNeill
Port Hardy
Queen Charlotte Strait
Quatsino
Smith Sound
Meadows Bay
Calvert Island
Queen Charlotte Sound
Hecate Strait
Dixon Entrance
Masset
Prince Rupert
Graham Island
Skidegate
Moresby Island
Porcher Island
British Columbia
Discovery Islands
Northern BC Coast
Courtenay
Baynes Sound
0 20 40 80 Km
0 10 20 40 60 Km
0 5 10 Km
0 2.5 5 10 Km
1:1,000,000
Coordinate System: NAD 1983 BC Environment Albers
Produced by DFO Aquaculture Management Division
Data: DFO Licensed Facilities; Last Updated: 15-11-2016
This map is for information only and is not to be used for navigational purposes. For a current list of licence holders, visit http://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/docs/shell-conch-processors-transformateurs-eng.html
AQUACULTURE MANAGEMENT
Legend
Licensed Shellfish Aquaculture Facilities (15-11-2016)
129°W
128°W
127°W
126°W
124°W
123°W
52°N
51°N
50°N
49°N

1.2.4 Cultured species

Today many of the shellfish cultured in BC are either introduced species or the progeny of native and introduced species. Prior to considering the introduction of any new non-native species, considerable review takes place to ensure that any potential risks associated with the introduction are mitigated. The following species of shellfish are the most actively cultivated within BC.

- Oysters: The Pacific oyster is the most widely cultivated shellfish in BC and the Pacific Northwest. The Kumamoto oyster [*C. sikamea*] (a different species closely related to the Pacific oyster) is cultivated in small numbers in BC.
- Clams: The Manila clam is the most commonly cultured clam in BC, and one of the most farmed clam 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 considered an invasive species that is licensed for incidental harvest, but may not be actively cultivated.
- Geoduck clams: Interest in geoduck clam culture began in the 1990s with cultivation taking place at several experimental sites. The number of sites culturing geoduck has expanded, and DFO is currently in the process of developing a management approach for the species.
- 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 the progeny of the Japanese scallop and the native weathervane scallop, known as the Pacific or Qualicum Beach scallop. Other scallops, including pink, spiny and giant rock scallop, have also been cultivated in small quantities in BC.
- Other Species: New species are being explored for culture because of their potential high value in international markets and/or due to their 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 list of shellfish species currently licensed in BC, with a summary of the most common culture types.

Shellfish Species Licensed for Aquaculture in BC, September 2015

Common Name	**Latin Name**	**Culture Type**
Butter Clam	*Saxidomus giganteus*	Intertidal
California Sea Cucumber	*Parastichopus californicus*	Subtidal and suspended
Eastern Blue Mussel	*Mytilus edulis*	Suspended
Eastern Oyster	*Crassostrea virginica*	Suspended
European Oyster	*Ostrea edulis*	Suspended
Gallo Mussel	*Mytilus galloprovincialis*	Suspended
Geoduck Clam	*Panopea generosa*	Intertidal, subtidal, suspended
Giant Rock Scallop	*Crassadoma gigantea*	Suspended
Green Sea Urchin	*Strongylocentrotus*	Suspended

Common Name	Latin Name	Culture Type
	droebachiensis	
Horse Clam	*Tresus capax*	Intertidal
Japanese Scallop	*Patinopecten yessoensis*	Suspended
Kumamoto Oyster	*Crassostrea sikamea*	Suspended
Littleneck Clam	*Protothaca staminea*	Intertidal
Manila Clam	*Tapes philippinarum*	Intertidal
Nutall's Cockle	*Clinocardium nuttalli*	Intertidal, subtidal
Pacific Oyster	*Crassostrea gigas*	Intertidal, subtidal, suspended
Pacific Scallop	*P. caurinus x yessoensis*	Suspended
Pink Scallop	*Chlamys rubida*	Suspended
Red Sea Urchin	*Strongylocentrotus franciscanus*	Suspended
Spiny Scallop	*Chlamys hastata*	Suspended
Weathervane Scallop	*Patinopecten caurinus*	Suspended
Western Blue Mussel	*Mytilus trossulus*	Suspended

*The list of species permitted for culture in BC may change over time.

Varnish (savory) clams (*Nuttalia obscurata*), an invasive species in BC, may be harvested but not cultivated.

1.2.4.1 Low Risk Primary and Bycatch Species

Intertidal, subtidal and suspended culture methods may grow a number of different species. In some cases within the area covered by an aquaculture licence, an aquaculturalist is permitted to retain naturally set species which have grown on the tenure or on the facility.

The following list of species outlines a generic list of intertidal and deepwater suspended species. Licences are issued to include all species on these lists for a specific culture type.

Low-Risk Intertidal Species:

- Manila Clam (*Venerupis philippinarum*)
- Pacific Oyster (*Crassostrea gigas*)
- Butter Clam (*Saxidomus giganteus*)
- Littleneck Clam (*Protothaca staminea*)
- Nuttall's Cockle (*Clinocardium nuttallii*)

Low-Risk Deepwater Suspended Species:

- Eastern Blue Mussel (*Mytilus edulis*)
- Western Blue Mussel (*Mytilus trossulus*)
- Pacific Oyster (*Crassostrea gigas*)
- Japanese Scallop (*Mizuhopecten yessoensis*)
- Pacific Scallop (*Patinopecten* x)
- Pink Scallop (*Chlamys rubida*)
- Spiny Scallop (*Chlamys hastata*)
- Weathervane Scallop (*Patinopecten caurinus*)

- Gallo Mussel (*Mytilus galloprovincialis*)
- Giant Rock Scallop (*Crassadoma gigantea*)

1.2.5 Culture Types

1.2.5.1 Intertidal Culture

Intertidal systems comprise bottom (beach) culture, where shellfish are planted directly in the substrate and near-bottom (epibenthic) culture, suspension over the substrate by means of rack/bag systems, and intertidal long lines. Oysters may be farmed in the intertidal zone, including their nursery rearing on shell cultch before grow-out in deeper water. Most clams are grown in the intertidal area.

1.2.5.2 Subtidal Culture

Some shellfish, for example geoduck clams, can be bottom cultured in the intertidal or subtidal areas. In subtidal operations seed is raised to a certain size in a hatchery/rearing environment and then transferred onto the seabed by hand, using an underwater mechanical seeder, or placed in tubes that are buried in the substrate. Often predator netting is used for the first couple of years of grow-out when shellfish are smaller and may be closer to the surface.

1.2.5.3 Suspended Culture

Increasingly, the culture of oysters and other bivalves have been moving to off-bottom systems which utilize floating rafts, buoys, and longlines to suspend shellfish above the ocean floor. Deepwater oysters can grow at a faster rate than intertidal oysters, although they are typically moved to the beach for defouling and hardening prior to sale. In BC currently all commercial mussel and scallop farming is done using suspended culture systems.

1.2.5.4 Standard Infrastructure

Under the shellfish aquaculture licence, certain types of standard culture gear are allowed to be introduced or moved within the area of the licence without a requirement for a licence amendment. Common infrastructure types are considered to be standard in their respective culture areas, provided that the following sensitive habitats are avoided: intertidal stream channels, eelgrass beds (*Zostera* sp.), fish spawning areas, *Species at Risk Act* listed species (Endangered species, Threatened and Species of Special Concern), residences or critical habitats, salt marsh, rocky reefs, kelp beds, glass sponge (*Hexactinellidae*) and/or coral complexes:

Intertidal:

- Addition or removal of predator netting
- Addition or removal of intertidal long-lines
- Addition or removal of rack and bag systems
- Addition or removal of oyster retention fencing (eg. Vexar fencing)

Deepwater:

- Addition or removal of rafts
- Addition or removal of long lines
- Addition or removal of a FLUPSY
- Addition or removal of work floats

1.2.6 Elements of Shellfish Aquaculture Management

Elements of shellfish aquaculture management can include the production or collection of seed, nursery rearing of juvenile shellfish, grow-out, harvesting, harvesting, transport, and imports. Each element has specific rules and regulations that relate to the shellfish aquaculture industry.

1.2.6.1 Seed Production

Shellfish culture begins with the production of seed/spat. While some oyster spat is collected in the wild in BC (most notably in Pendrell Sound) under the authorization of an *Access Licence*, the trend is towards greater production of seed/spat through hatcheries from broodstock. Most clam, mussel, and scallop spat in the province are hatchery-sourced. Growers can acquire their seed pre-set (e.g. attached to cultched shell or tubes), or aquaculturalists can set larvae on site in tanks with seed collectors. Seed are usually acquired in the spring or early summer, to maximize growth.

Much of the oyster seed and larvae and clam seed purchased today by BC shellfish growers are imported. Federal regulations prohibit the unauthorized introduction and transfer of shellfish into fish habitat when seeding an aquaculture site (see the *Fishery (General) Regulations*, Sections 54 to 57).

Under the National Code on Introductions and Transfers of Aquatic Organisms, Introductions and Transfers (I&T) licences are issued by DFO (jointly with the Province of BC in the case of freshwater species). The federal-provincial I&T Committee reviews all licence applications to assess the ecological, disease, and genetic risks, and may stipulate mitigation measures as a Condition of Licence. The National Code provides uniform guidelines for application reviews and risk assessments. Further information can be found at the following website: http://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/intro-trans/index-eng.html .

1.2.6.2 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, suspended, land-based, or floating with seawater flow-through in the form of upwellers and downwellers.

1.2.6.3 Grow-out

Depending on the species, when seed reach a certain size they are transferred for final grow-out to intertidal, subtidal, or suspended facilities. Depending on the facility, a variety of grow-out methods can be used, including beach planting, near-bottom bags and cages, or ropes and trays suspended from longlines or rafts. Key issues related to grow-out include: controlling the impacts of predators, siltation, and ensuring the integrity of the site in rough water conditions. In addition, water quality (biotoxins, sanitary conditions) is of high importance during this phase of grow-out.

1.2.6.4 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.

1.2.6.5 Harvesting

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

1.2.6.6 Storage and Handling

Before being shipped for processing, shellfish may be temporarily stored at a licensed facility approved for this purpose. Wet storage can take place in intertidal areas using mesh bags or pouches and in deepwater storage may utilize nets, bags, or sink floats. Mussel growers may also wash and de-clump their product prior to shipping with clean, uncontaminated water. All bivalve shellfish are required by law to be landed at a federally regulated processing plant.

1.2.6.7 Transportation of Shellfish

Aquaculture licences issued under the *Pacific Aquaculture Regulations* generally allow for movements of licensed shellfish within zones subject to the Conditions of Licence. Under certain circumstances, shellfish aquaculture licence-holders may also transfer shellfish between different geographic locations as noted below.

For geoduck and sea cucumber, an Introductions and Transfers (I&T) Licence is required even for within zone transfer activities such as taking broodstock to the hatchery or planting juvenile stock on the licensed tenure.

For transfers between shellfish transfer zones not outlined in the licence, for transfer of a species not listed on the licence, or in circumstances where the licence conditions cannot be met, a separate I&T licence is required. A map indicating shellfish transfer zones can be found online at: http://www.pac.dfo-mpo.gc.ca/aquaculture/maps-cartes-eng.html#Shellfish_Transfer .

Applications for I&T licences are made to the Introductions and Transfers Committee at famitc@dfo-mpo.gc.ca.

More information on Introductions and Transfers is available on the internet: http://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/intro-trans/index-eng.html.

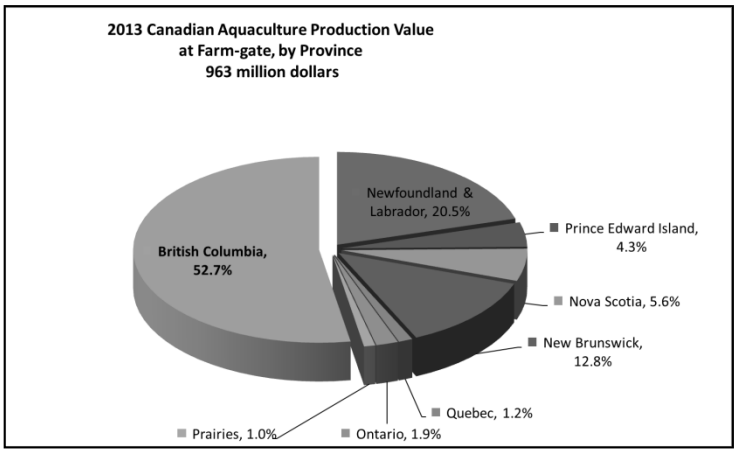
1.2.6.8 Imports of Shellfish

In addition to an I&T permit, the Canadian Food Inspection Agency requires that aquaculturalists importing shellfish obtain an import permit under the *Health of Animals Regulations* for shellfish seed and larvae of listed "susceptible species." Ten of BC's licensed shellfish culture species are now on the list, including Pacific oysters, Manila clams, and blue and Gallo mussels. This permit requirement took effect March 1, 2011.

Importers are also responsible for ensuring they comply with all federal, provincial, and municipal requirements for importation. See further information regarding the importing process and CFIA's requirements at: http://www.inspection.gc.ca/animals/aquaticanimals/imports/eng/1299156741470/1320599337624 .

1.3 Economic Profile of the Shellfish Aquaculture Sector

Canada is the 26th largest producer of aquaculture products in the world, primarily due to finfish production.[2] Aquaculture production occurs across Canada, although the bulk of production is in the Atlantic Provinces and BC. In 2013, Canadian aquaculture production had a final product value of approximately $1.0 billion; shellfish accounted for about 10% of the value.



BC is the second largest producer of farmed shellfish in Canada, after Prince Edward Island, accounting for about a third of the farmgate value for shellfish. BC is also the largest Canadian producer of cultured clams, oysters, and scallops.[3]

In 2011, shellfish aquaculture production contributed almost $16 million in GDP to BC economy from expenditures (e.g. equipment).[4,5] This is about 9% of the GDP contribution from aquaculture in the province but less than 0.01% of the GDP from all provincial industries. While detailed estimates are not available, aquaculture also has additional indirect impacts on the economy due to expenditures by suppliers and induced impacts as employees of aquaculture companies and their suppliers spend their earnings. Processing beyond the farmgate also provides economic benefits.

Cultured shellfish production in BC has grown considerably over the past two decades. Despite this growth, cultured shellfish still only accounts for 3% of the landed/farmgate value BC's total seafood harvest and about 4% of the farmgate value of marine aquaculture in the province.[6] Shellfish culture has grown relative to the wild fishery, now accounting for about 15% of the landed/farmgate and wholesale values for shellfish in the province, and about 37% of volume.

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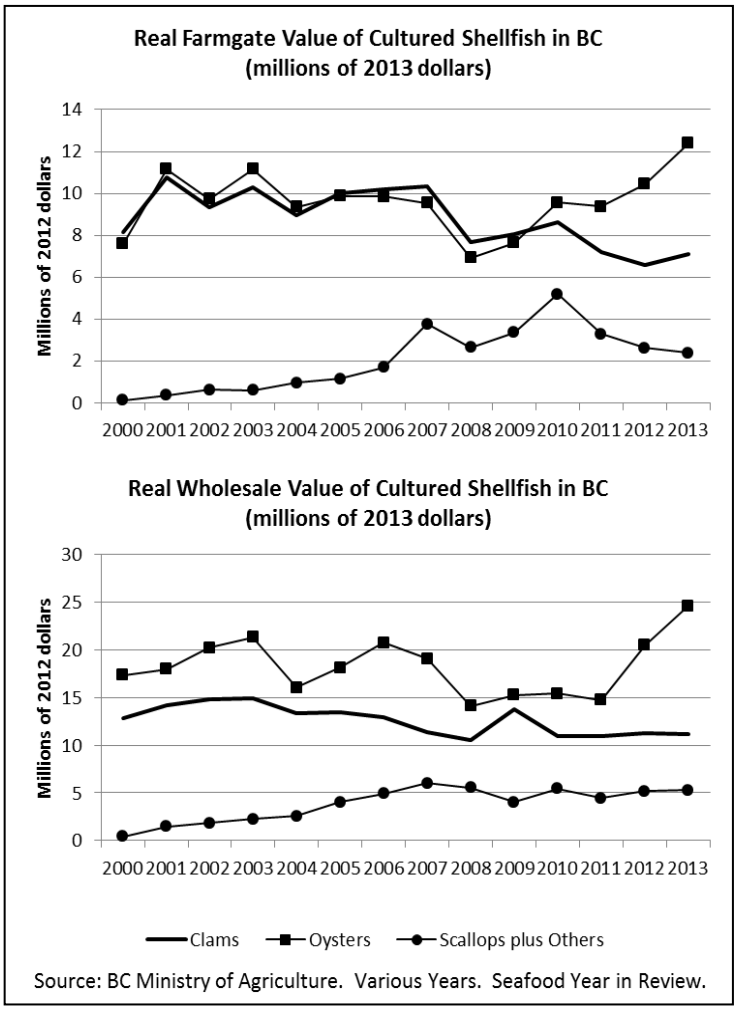
[2] Food and Agriculture Organization of the United Nations (FAO). Global Aquaculture Production 1950 – 2013.. Online dataset available at: http://www.fao.org/fishery/statistics/global-aquaculture-production/query/en . Accessed: July 2015.

[3] Source of data is Statistics Canada (Cat. No 23-22-X).
Data is available at:
http://www.dfo-mpo.gc.ca/aquaculture/sector-secteur/stats-eng.htm.
Accessed: August 2015.

[4] Gross Domestic Product (GDP) from measures the value added to the economy and includes wages, owner profits, returns to invested capital, changes in inventories and depreciation.

[5] BCStats. 2013. British Columbia's Fisheries and Aquaculture Sector, 2012 Edition. Available: http://www.bcstats.gov.bc.ca/Publications/AnalyticalReports.aspx. Accessed: August 2015.

[6] BC Ministry of Agriculture. British Columbia Seafood Year in Review. Years 2012 and forward available at: http://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/about-agriculture-and-seafood-in-bc/statistics/industry-and-sector-profiles Years 2011 and earlier available at: http://www.env.gov.bc.ca/omfd/reports/#STATPUB. Accessed: August 2015.



The growth of the cultured shellfish sector in BC was particularly rapid in the 1990s. Between 1990 and 1999, production rose from 4,600 tonnes to 6,700 tonnes (up 46%), while the real (inflation adjusted) farmgate value increased by over two times as markets strengthened and prices increased.[7] Over the most recent decade (2004 – 2013) production volume declined by 20% by 48% and the real farmgate value increased by 40% to $22 million (2013 dollars).

Between 2004 and 2013, the real wholesale value of cultured shellfish increased by 29% to $41.1 million (2013 dollars). A substantial part of the growth in the sector was in species other than oysters, in particular clams. In 1990, clams accounted for 1% of production and 4% of the farmgate value. By 2000, clams accounted for 15% of production and 49% of farmgate value. Over the following decade, other shellfish species expanded such that, in 2013, clams continued to account for 15% of production, but only 38% of the farmgate value. In 2013, these other species accounted for 5% of production and 11% of landed value. Oysters continue to account for the majority of wholesale value from cultured shellfish, averaging over 51% over the past 10 years. The difference in shares between farmgate value and wholesale value reflects the greater degree of processing for a major share of oyster production.[8]

1.4 Employment

The aquaculture sector in BC provided an average of about 1,600 jobs per year between 2007 and 2011; an allocation between shellfish and finfish is not available.[9,10] A 2003 survey of provincial aquaculture employment has provided the basis for past estimates of jobs and full-

[7] BC Ministry of Agriculture. Various Years. British Columbia Seafood Industry Year in Review. Years 2012 and forward available at: http://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/about-agriculture-and-seafood-in-bc/statistics/industry-and-sector-profiles Years 2011 and earlier available at: http://www.env.gov.bc.ca/omfd/reports/#STATPUB. Accessed: August 2015.
[8] About half of BC oysters are shucked and packed into containers, which is a labour-intensive process.
[9] BCStats. 2013.
[10] During this same period, the average for the capture fishery in BC was about 2,000 jobs (BCStats, 2013).

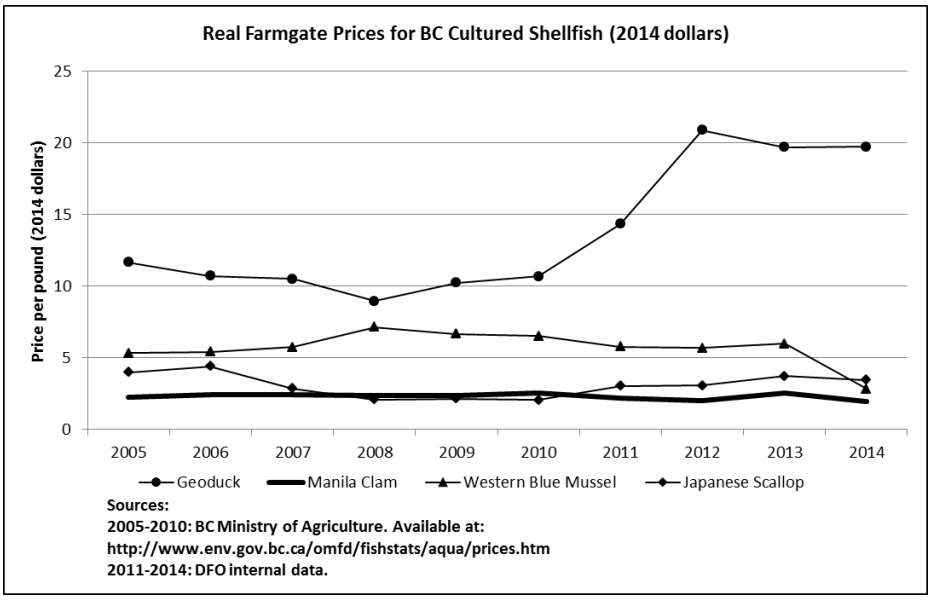
time positions in aquaculture in BC.[11] Compared to other resource-based industries, including salmon aquaculture, shellfish farming is labour-intensive, but the employment tends to be seasonal. Based on this methodology, shellfish culture would have generated 320 person-years (PYs) of direct employment per year between 2007 and 2011, about 20% of the aquaculture employment.[12]

While employment in aquaculture as a whole tends to be year-round compared to other sectors (e.g. the wild fishery), shellfish culture generally has more seasonal workers than finfish culture. Roughly half of all aquaculture jobs are held by workers under the age of thirty. Shellfish farming is estimated to employ directly over 100 people within the Baynes Sound area.[13]

In addition to direct employment, the expenditures of aquaculture companies result in indirect employment impacts in the economy. Estimates for these impacts range from a low of about 60 based on general multipliers to approximately 600 jobs.[14] 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.

1.5 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.



[11] Gislason & Associates. 2004. B.C. Seafood Sector and Tidal Water Recreational Fishing - A Strengths, Weaknesses, Opportunities, and Threats Assessment. Summary. Available at: http://www.env.gov.bc.ca/omfd/reports/SWOT/SWOT_6.0.pdf. Accessed: July 2015.

[12] 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. Available at: http://www.env.gov.bc.ca/omfd/fishstats/aqua/employ-03.html. Accessed: November 2013.

[13] Community Profile: Comox Valley, British Columbia. 2012. Available at: http://www.dfo-mpo.gc.ca/aquaculture/sector-secteur/commun/comox-eng.htm. Accessed: July 2015.

[14] See BCStats (2013) for the multiplier method, and for the higher estimate see: Vancouver Island University – Centre for Shellfish Research at: http://www.viu.ca/csr/industry/industrybackground.asp. Accessed July 2015

BC is only a minor player on the world stage for cultured shellfish exports, and producers face competition from the US Pacific Northwest and globally from countries such as China, Chile, Mexico, and New Zealand. Washington State's shellfish aquaculture industry, for example, is around six times the size of that of BC.

Shellfish prices vary significantly by species, as indicated in the figure above. Some of the species for which cultivation has only been recently introduced, including geoducks, receive higher prices than primary species, such as Manila clams. Prices have been relatively flat for the main culture species of Pacific oysters and Manila clams.[15] This reflects the commodity nature of these products, in particular oysters which sell into highly competitive US markets.

Due to a reliance on export sales, pricing is sensitive to exchange rate fluctuations. The depreciation of the Canadian dollar against the US dollar may provide support to BC producers.

[15] Pacific oysters are not shown in the graphic because data are not complete for farmgate prices expressed in dollars per unit weight. Quantity for the majority of product is reported in US gallon for shucking oysters and in dozen for in-shell product. For the smaller set of data reported in weight, the average price 2008-2014 has been about $3 per pound (in 2014 dollars) with the price declining between 2008 and 2012, and rising more recently.

2. LEGISLATION, GOVERNANCE & POLICY

2.1 Legislation

DFO's aquaculture management approach in BC is guided by the broader mandate and strategic priorities of the Department. 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 fisheries interests in oceans and fresh waters. For the purposes of aquaculture in BC, the most relevant pieces of legislation are:

- The *Fisheries Act* which provides, among other things, broad powers to the Minister for the proper management and control of commercial, aboriginal, and recreational fisheries, and the activity of aquaculture. As part of various long-standing arrangements, the provinces have assumed administrative responsibility for the management of most inland fisheries.
- The *Oceans Act*, among other things, provides authority to the Minister to lead the development and implementation of plans for the integrated management of activities affecting estuaries, coastal and marine waters, and the coordination of oceans issues. The *Act* also establishes the Minister's responsibility for Coast Guard services, as well as responsibility for marine science services such as the Canadian Hydrographic Services' nautical charts and publications.
- While the Minister of Environment has primary responsibility for the administration of the *Species at Risk Act*, the Minister of Fisheries and Oceans is the minister responsible for aquatic species. The purpose of the *Act* is to "prevent wildlife species from being extirpated or becoming extinct, and to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened."

DFO supports strong economic growth in the aquaculture and capture fisheries sectors and contributes to a prosperous economy through global commerce by supporting exports and advancing safe maritime trade. The Department supports the innovation needed for a knowledge-based economy through research in expanding sectors such as aquaculture and biotechnology. The Department contributes to sustainable aquatic ecosystems for Canadians through habitat protection, oceans management, and ecosystems research. A safe and secure Canada relies on the maritime security, safe navigation, presence on our waters, and effective search and rescue services that the Canadian Coast Guard provides.

DFO's Mission and Vision, along with additional information on the organization, is provided on the Department's web pages (http://www.dfo-mpo.gc.ca/us-nous/vision-eng.htm).

> DFO's Mission: Through sound science, forward-looking policy, and operational and service excellence, Fisheries and Oceans Canada employees work collaboratively toward the following strategic outcomes:
>
> - economically prosperous maritime sectors and fisheries;
> - sustainable aquatic ecosystems; and
> - safe and secure waters.

> DFO's Vision: To advance sustainable aquatic ecosystems and support safe and secure Canadian waters while fostering economic prosperity across maritime sectors and fisheries.

The Department's goals are to increase the economic benefits associated with Canada's maritime sectors, fisheries, and aquaculture and to enhance the competitiveness of these sectors in existing areas, as well as in emerging areas such as Canada's North.

Other federal agencies also have important legislation governing aquaculture. The Canadian Food Inspection Agency is responsible for the *Health of Animals Act*; Health Canada the *Food and Drug Act* and the *Pest Control Products Act*, and Transport Canada the *Navigation Protection Act*.

In British Columbia, provincial legislation relates to business and labour aspects, processing of fish, as well as the tenuring of Crown land.

2.2 Regulation

The *Fishery (General) Regulations*, the *Pacific Aquaculture Regulations*, and the *Aquaculture Activities Regulations* are the main *Fisheries Act* regulations governing the activity of aquaculture activities in BC. These regulations frame the management and regulation of aquaculture activities on the Pacific coast, including the establishment of a licensing regime consistent with other fisheries managed by DFO but tailored to address the unique aspects of the aquaculture sector.

Conditions of Licence developed under the *Pacific Aquaculture Regulations* incorporate aspects of aquaculture management that were covered in the former provincial regulations and licensing regime, and also include those aspects previously managed federally, including: introductions and transfers of fish, marine mammal interactions, and habitat protection.

The *Aquaculture Activity Regulations* clarify conditions under which aquaculture operators may treat their fish for disease and parasites, as well as deposit organic matter, under sections 35 and 36 of the Fisheries Act. They allow aquaculture operators to do so under specific restrictions to avoid, minimize and mitigate any potential serious harm to fish and fish habitat. The Regulations also impose specific environmental monitoring and sampling requirements on the industry, and facilitate improvements in public reporting.

Management of Contaminated Fisheries Regulations provide guidance with respect to the issuance of harvest licences in contaminated areas.

The *Aquatic Invasive Species Regulations* provide guidance with respect to the management and compliance and enforcement of aquatic invasive species. These regulations also outline the species subject to prohibitions and controls.

2.3 Policy

While legislation and regulations provide a legal framework for the management of aquaculture in BC, DFO policies and management approaches provide more specific context and guidance relating to how that framework is translated into management of the sector.

DFO's Aquaculture Policy Framework provides a high level overview of aquaculture management. Numerous other policies relate to DFO's approach on specific diverse aspects of aquaculture management, such as introductions and transfers of fish, broodstock collection, compliance and enforcement approaches, and interaction with wild species designated under the *Species at Risk Act*.

2.3.1 Fisheries and Oceans Canada Aquaculture Policy Framework

As the lead federal agency for aquaculture development, and consistent with its Departmental mandate, DFO discharges its responsibilities in a manner that adheres to the following Aquaculture Policy Framework principles:

- DFO will support aquaculture development in a manner consistent with its commitments to ecosystem-based and integrated management, as set out in Departmental legislation, regulations and policies.
- DFO will address issues of public concern in a fair and transparent manner, based on science and risk-management approaches endorsed by the Government of Canada.
- DFO will communicate with Canadians and seek their input on issues pertaining to aquaculture development.
- DFO will respect constitutionally protected Aboriginal and treaty rights and will work with interested and affected Aboriginal communities to facilitate their participation in aquaculture development.
- Recognizing that aquaculture is a legitimate user of land, water and aquatic resources, DFO will work with provincial and territorial governments to provide aquaculturists with predictable, equitable and timely access to the aquatic resource base.
- DFO will strive to ensure that its own legislative and regulatory frameworks enable the aquaculture sector to develop on an even footing with other sectors.
- In consultation with other federal departments, the provinces and territories, the academic sector and industry, DFO will support responsible development of the aquaculture sector.
- DFO will make every effort to understand the needs of the aquaculture industry and to respond in a manner that is solutions-oriented and supportive of aquaculture development.
- DFO will work with other federal departments, and with provincial and territorial governments, to coordinate policy development, integrate regulatory frameworks, and improve service delivery.

Through this policy framework, DFO is committed to being both an enabler and a regulator of aquaculture development, affirming its role as a Department engaged in sustainable resource development. In this context, "enabling" means improving the business climate for aquaculture development to benefit Canadians. DFO achieves this by:

- ensuring that DFO's laws and regulations relating to aquaculture are clear, efficient, effective, consistently applied and relevant to the sector;
- investing in aquaculture science and research and development;
- working in partnership with provinces and territories to develop a proactive siting process; and
- considering support for industry development programs consistent with DFO's mandate and objectives.

Further information regarding DFO's Aquaculture Policy Framework can be found at the following website: http://www.dfo-mpo.gc.ca/aquaculture/ref/APF-PAM-eng.htm.

2.3.2 Aquaculture Development Strategy

As a follow up to the National Aquaculture Strategic Action Plan Initiative, in 2016 the Canadian Council of Fisheries and Aquaculture Ministers released the Aquaculture Development Strategy: 2016 - 2019. This document outlines a three-year strategy to implement a collaborative federal-provincial-territorial plan that supports continued growth in sustainable aquaculture production: http://www.dfo-mpo.gc.ca/aquaculture/collaboration/ccfam-eng.html.

2.3.3 Sustainable Aquaculture Program

The Canadian aquaculture industry operates responsibly within rigorous environmental standards, some of the strongest in the world. These standards are based on the best available scientific research, and are in place to safeguard the environment and wild fish stocks.

The Government of Canada undertakes numerous initiatives in order to secure a successful and sustainable aquaculture industry across Canada. These initiatives streamline the regulatory process, strengthen science to create performance-based environmental standards, spur innovation to enhance the sector's competitiveness and productivity, and support the development of certification schemes to meet rigorous quality standards in international markets.

The guiding principles of the renewed Sustainable Aquaculture Program (2013 – 2018) are as follows (http://www.dfo-mpo.gc.ca/aquaculture/programs-programmes/sustainable-durable/renewed-renouvele-eng.htm):

- Regulatory Science: Improved science knowledge and advice to inform regulatory decision-making and policy development;
- Regulatory Reform and Governance: Improved regulatory certainty through better coordination among regulatory authorities; and
- Aquaculture Public Reporting: Improved reporting on the environmental and economic performance of Canada's aquaculture sector.

2.3.4 British Columbia Aquaculture Regulatory Program

The British Columbia Aquaculture Regulatory Program was established in 2010 in order to carry out DFO's responsibilities related to aquaculture in BC. In particular, the Program is designed to implement federal regulations under the *Fisheries Act* and carry out the day-to-day management of the fisheries and environmental aspects of aquaculture, including marine finfish, shellfish and freshwater / land-based aquaculture.

These responsibilities include a number of areas previously managed by the Province of British Columbia (until December 2010) such as aquaculture licensing, environmental monitoring, and the approval of site management plans, as well as matters historically managed by DFO such as habitat protection, introductions and transfers of fish, and marine mammal interactions.

DFO's aquaculture-related responsibilities are carried out by staff both located in both Ottawa and Pacific Region. The majority of program staff are located in Vancouver and in various communities on Vancouver Island (Nanaimo, Campbell River, Courtenay, Port Hardy).

Under the Program, DFO is responsible for a range of aquaculture activities, including:

- developing operational policies and Integrated Management of Aquaculture Plans;
- reviewing licence applications, setting appropriate licence conditions, issuing licences, and reviewing facility management plans;
- liaising with stakeholders, other governments and First Nations;
- reporting publicly on the performance of the aquaculture industry;
- conducting compliance evaluations for environmental protection;
- reviewing and analyzing environmental and compliance data; and
- evaluating the effectiveness of environmental protection.

Consistent with the legislative, regulatory and policy framework outlined above, DFO has identified the following as the key management objectives of the British Columbia Aquaculture Regulatory Program:

- maintaining healthy and productive aquatic ecosystems;
- supporting an aquaculture industry that is environmentally, economically and socially sustainable;
- supporting economic opportunities through sustainable growth and development of the aquaculture sector in BC;
- ensuring sound environmental performance on the part of the aquaculture industry;
- providing an efficient and effective regulatory system for aquaculture in BC;
- supporting First Nations participation in aquaculture;
- meeting obligations related to First Nations consultation;
- engaging First Nations, industry, other levels of government and stakeholders in management of the aquaculture sector;
- taking an open and transparent approach to the management of aquaculture in BC; and
- maintaining a high level of compliance with DFO regulations and licence conditions.

DFO employs a range of management measures which support Departmental objectives related to aquaculture. These are intended to work in concert with the jurisdictions of other agencies with regulatory authority over aspects of aquaculture management such as the Canadian Food Inspection Agency under the *Health of Animals Act*.

2.4 Compliance and Enforcement

Monitoring, audit and enforcement are an integral part of DFO's approach to management of the aquaculture industry. DFO's Conservation and Protection (C&P) staff, Fishery Officers, and other Aquaculture Management Directorate staff play key roles in this approach.

The Aquaculture Management Directorate C&P unit is also part of the broader C&P sector in BC. This unit was established with the primary role of enforcing compliance with the *Fisheries Act*, the *Pacific Aquaculture Regulations*, the *Marine Mammal Regulations*, the *Aquaculture Activities Regulations*, the *Management of Contaminated Fisheries Regulations*, the *Species at*

Risk Act, and other relevant legislative responsibilities. Fishery Officers responsible for aquaculture enforcement are stationed on Vancouver Island in Campbell River and Nanaimo.

DFO Fishery Officers conduct investigations and take enforcement actions based on C&P site inspections and information from sources including: inspections undertaken by the Aquaculture Management Directorate; staff who monitor and manage industry reporting; and information from the public.

In collaboration with the enforcement activities conducted by Fishery Officers, DFO has a team of dedicated veterinarians, biologists, fish health technicians, and resource managers who verify that aquaculture facilities comply with the *Pacific Aquaculture Regulations* as well as all Conditions of Licence. The data gathered by DFO staff through site inspections and technical audits provide information related to the environmental and operational performance of the aquaculture industry in BC.

As a part of the BC enforcement approach, Fishery Officers perform three main enforcement activities:

- Education and Shared Stewardship: The Department promotes compliance with the *Fisheries Act* and the *Pacific Aquaculture Regulations* through education and awareness activities directed at both industry and the public. Public education and awareness activities encourage Canadians to protect fishery resources and habitats.
- Monitoring, Control and Surveillance: Enforcement activities are carried out by Fishery Officers who conduct regular patrols on the land, on the water and in the air. Fishery Officers conduct inspections to validate licence reporting, and to determine compliance with aquaculture licences, Conditions of Licence and other applicable legislation.
- Investigations: Fishery Officers respond to complaints and conduct investigations. Additional information about Fishery Officer duties is available on the DFO website: http://www.dfo-mpo.gc.ca/fm-gp/enf-loi/officer-agent-eng.htm .

2.5 Science in Support of Aquaculture

DFO undertakes a science-based approach while implementing the *Pacific Aquaculture Regulations* and the British Columbia Aquaculture Regulatory Program. DFO's scientific research informs regulatory decision-making. This research also improves our understanding of the interactions of farmed and wild finfish and shellfish, as well as the environment on which these species depend.

DFO is involved in a number of aquaculture science and research activities designed to:

- better understand and regulate the potential environmental interactions of aquaculture activities;
- develop new and enhanced tools and technologies to ensure optimal fish health; and
- establish sustainable, ecosystem-based practices.

Results of this research help inform regulatory and policy development and decision-making (within the Department and other government departments and agencies), and support the responsible growth of Canada's aquaculture industry.

DFO's aquaculture research activities fall mainly under two key programs within the Sustainable Aquaculture Program: the Program for Aquaculture Regulatory Research (PARR), and the Aquaculture Collaborative Research and Development Program (ACRDP).

The PARR supports research activities that build understanding and the knowledge base that is used to inform DFO's aquaculture and fisheries protection regulations and policy decision making. This includes the Department's ecosystem-based and environmental regulations. More information on PARR can be found at the following website: http://www.dfo-mpo.gc.ca/aquaculture/parr-prra/index-eng.html.

The ACRDP is a DFO initiative designed to increase the level of collaborative research and development activity between the aquaculture industry and the Department. The ACRDP teams industry with DFO researchers to undertake research that lies within DFO's mandate, but is based on the needs and priorities of the aquaculture industry. More information regarding ACRDP can be found at the following website: http://www.dfo-mpo.gc.ca/aquaculture/acrdp-pcrda/index-eng.htm.

Other related programs and activities include Science Peer Review (http://www.dfo-mpo.gc.ca/aquaculture/sci-res/spr-eng.htm), Canadian Integrated Multi-Trophic Aquaculture Network (http://www.dfo-mpo.gc.ca/aquaculture/sci-res/imta-amti/index-eng.htm), and Aquatic Animal Health Science (http://www.dfo-mpo.gc.ca/science/aah-saa/index-eng.htm).

The broad range of aquaculture research initiatives currently being undertaken by the Department, as well as other individuals and institutions (e.g. universities, environmental groups, private consultants, First Nations), and those completed in recent years are summarized in the biennially published *Canadian Aquaculture Research & Development Review*. More information regarding the Review can be found at: http://www.dfo-mpo.gc.ca/aquaculture/sci-res/rd-eng.htm. The 2015 Review can be found here: http://www.dfo-mpo.gc.ca/science/environmental-environnement/aquaculture/rd2015/index-eng.html.

The Department has undertaken a number of comprehensive science reviews which have evaluated the state of knowledge and research needs in the area of aquaculture-environment interactions. In addition to these broad review processes, individual Canadian Science Advisory Secretariat (CSAS) processes are routinely undertaken to evaluate emerging issues and science developments. The resulting Advisory Reports, as well as *Research* documents and *Proceedings* documents, are posted on the CSAS website: http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

The Department recognizes the importance of research on aquaculture - environmental interactions as well as broader marine ecosystem and fisheries issues which is conducted by individuals and institutions (e.g. universities, environmental groups, private consultants, First Nations). Reports and publications resulting from these studies are reviewed and evaluated through CSAS processes. External experts may participate in CSAS peer review process workshops and can have active involvement in the formulation of Science Advisory documents.

2.6 Developing Science and Research Priorities

DFO works collaboratively with First Nations, industry, and stakeholders to identify ongoing science and research priorities. Regional priorities are then considered within a national context.

Recently DFO's national aquaculture regulatory research priorities for shellfish aquaculture have focused on the following themes:

- Cumulative Effects and Ecosystem Management Strategies (e.g. carrying capacity frameworks, aquatic invasive species risks, ecosystem assessment to support potential boundary delineation and development of area based indicators);
- Interactions with Wild Populations (e.g. shellfish transfer zones and shellfish hatchery protocols, risk assessment for review of new aquaculture species and techniques);
- Canadian Shellfish Sanitation Program (e.g. improvements to coordination and implementation of CSSP).

The Department seeks external input into science and research priorities through advisory committee processes. Science and research benefit from the collaborative engagement of governments, First Nations, industry, and stakeholders, working collaboratively to identify priorities and to carry out initiatives.

2.7 Integration of Traditional and Local Knowledge

In developing and implementing its aquaculture management approach, the Department is committed to working with First Nations, other levels of government, industry, and stakeholders in order to integrate traditional and local knowledge into the aquaculture management framework. Through collaborative processes with First Nations and local communities, DFO continues to improve its understanding of how traditional and local knowledge can be effectively utilized to improve the management of aquaculture.

2.8 Engagement and Advisory Processes

In order to facilitate open and transparent communication relating to the management of shellfish aquaculture, DFO works with First Nations, industry, and stakeholders to establish the Shellfish Aquaculture Management Advisory Committee (SF-AMAC). The SF-AMAC is a multi-stakeholder forum which is tasked with providing feedback to DFO on the coast-wide management of shellfish aquaculture. Further information on the SF-AMAC is available on the DFO consultation webpage: http://www.pac.dfo-mpo.gc.ca/consultation/aquaculture/index-eng.html.

The SF-AMAC brings together a range of interests related to aquaculture to provide coordinated analysis and advice to DFO with regard to aquaculture management in BC. AMACs provide a venue for discussion and dialogue, both between and among First Nations, industry, stakeholders and other levels of government. This advice plays an important role in the ongoing development of the SF-IMAP, and provides a transparent opportunity for interested groups to better understand and participate in the management and planning process for aquaculture.

In addition to this integrated forum, DFO has also established bilateral processes with First Nations, the aquaculture industry, and environmental non-governmental organizations. These processes complement, inform and support the discussions taking place in the AMAC and allow for more focused discussion on specific issues.

Through programs like the Aboriginal Aquatic Resource and Oceans Management (AAROM) and the Pacific Integrated Commercial Fisheries Initiative (PICFI), DFO has invested in building First Nations capacity and engagement related to aquaculture. These funds have been used to

improve communications and information sharing among First Nations on aquaculture issues, and to support technical capacity for First Nations to effectively engage in discussions related to aquaculture management.

In addition to consultation and engagement with individual First Nations and other AAROM bodies, DFO continues to work closely with the First Nations Fisheries Council (FNFC) to seek advice and assist with coordination of First Nations' engagement in aquaculture management issues on a broader, province-wide basis. This includes processes and capacity for First Nations to engage with one another, with DFO, and with other interests through the AMACs and other processes.

2.9 First Nations Consultation

Consultation with First Nations is a key part of DFO's aquaculture licensing and review process. Consistent with legal obligations and the federal duty to consult, DFO consults with First Nations on new aquaculture licence applications, renewals and amendments where there is the potential to impact claimed and/or established Aboriginal rights and title.

The Province of BC (Front Counter BC) coordinates the receipt and distribution of information when an aquaculture application is submitted through a "single window" approach. DFO works with the Province of BC and Transport Canada through a harmonized application and review process where practical. The respective agencies work to coordinate consultation with First Nations (and other interests) including information sharing and, where appropriate, joint consultation carried out by the respective agencies.

When DFO reviews an aquaculture application the Department identifies those First Nations potentially impacted by the decision and provides them with a detailed overview (referral package) of the application, including the proposed site, as well as opportunities and potential timeframes for comments and feedback on the application. All comments are reviewed and carefully considered by the Department, including key issues and potential impacts identified by First Nations through the consultation process.

In addition to consultations undertaken by DFO, the Department also encourages aquaculture proponents (e.g. licence holders, applicants) to engage local First Nations prior to applying for a new licence or amendment.

3. MANAGEMENT APPROACH

3.1 Federal-Provincial Roles and Responsibilities

The regulation and management of aquaculture is an area of shared jurisdiction in BC. In December 2010, DFO and the Province of BC signed an *Agreement on Aquaculture Management* which outlines federal and provincial responsibilities related to aquaculture in BC: http://www.gov.bc.ca/agri/attachments/canada_bc_al_agree.pdf .

This agreement lays out the primary roles of the federal and provincial governments related to aquaculture management. The primary responsibilities of Fisheries and Oceans Canada include:

- issuing licences for marine and freshwater aquaculture, including hatcheries;
- assessing modifications to existing aquaculture facilities;
- establishing licence conditions to conserve and protect fish and fish habitat;
- enforcing new aquaculture regulations;
- conducting science and aquaculture research; and
- reporting publicly on environmental and regulatory performance of industry.

The Province of British Columbia remains responsible for:

- issuing tenures for marine or freshwater environments;
- regulating the business aspects of aquaculture (e.g. workplace health and safety); and
- reporting on seafood exports.

Under the Agreement, DFO, Transport Canada and the Province of BC have implemented a harmonized approach to aquaculture-related authorizations and decision-making. To simplify the application and review process for the aquaculture sector, the lead agencies have developed a harmonized application package for the collection of information necessary to apply for federal authorizations under the *Fisheries Act* (*Pacific Aquaculture Regulations*) and the *Navigation Protection Act* and, to apply for provincial authorization under the *BC Land Act.*

The harmonized application package must be used for all aquaculture applications, including new shellfish and amendment applications, where one or more of the above-noted authorizations are required. Depending on the specifics of the application, there may be other authorizations required (e.g. provincial Water Licence).

In addition to the harmonized application and review process, the lead agencies have also established a number of committees and working groups in order to support implementation of the Canada-BC Agreement.

3.2 Siting Considerations (Criteria)

DFO conducts a thorough review of all new licence and amendment applications for shellfish aquaculture. Depending on the nature of the application, this review may include:

- Fish habitat (e.g. sensitive benthic habitat, water quality);
- Fish resources (e.g. wild fish populations);
- Species at risk;
- Ecosystem effects;
- Commercial, recreational and Aboriginal fisheries;

- First Nations use of land and resources for traditional purposes.

If an aquaculture operation is sited appropriately, it can significantly reduce the potential for impacts on fish and fish habitat. Through both siting and additional mitigation measures (e.g. conditions of licence, environmental monitoring), DFO works with the aquaculture industry to ensure that individual sites and the sector are operated in a sustainable manner.

In some cases zoning recommendations, which are administered by local governments, may relate to the marine and foreshore area.

As the scientific understanding of the relationship between shellfish farming and the environment increases, it is anticipated that the above siting considerations and the mechanisms to evaluate them will continue to evolve.

3.3 Integrated Geoduck Management Framework

In March 2017 DFO released the Integrated Geoduck Management Framework (IGMF). The complete IGMF can be found at http://www.pac.dfo-mpo.gc.ca/aquaculture/management-gestion/2017/geoduck-panope/geoduck-panope-igmf-cgip-2017-eng.html. Geoduck aquaculture as outlined in the IGMF represents an opportunity to diversify the economies of coastal and Indigenous communities in British Columbia while maintaining the economic prosperity and long-term sustainability of the wild geoduck fishery.

3.4 National Aquatic Animal Health Program

The National Aquatic Animal Health Program (NAAHP) is a science-based regulatory program, designed to meet international standards for aquatic animal health management. Led by the Canadian Food Inspection Agency (CFIA) with DFO support, the program has a number of components, including the listing of diseases of concern; import controls and export health certification; field sampling for disease surveillance; disease control measures; and laboratory testing, research and development. See further at: http://www.inspection.gc.ca/animals/aquatic-animals/eng/1299155892122/1320536294234.

3.5 Health of Animals Reporting

The *Health of Animals Regulations* lists a number of "reportable diseases" that are of concern to animal health or the economy of Canada. Requirements under the regulations ensure that aquatic animals and their products, which could pose a risk for the spread of disease, meet the requirements of international standards for national disease management. There is a legal requirement to report diseases which pose a threat to aquatic animals: http://www.gazette.gc.ca/rp-pr/p1/2009/2009-12-19/html/reg1-eng.html .

3.6 Management of Contaminated Fisheries Regulations

DFO is responsible for the control of the harvest of shellfish in contaminated areas, as defined in the *Management of Contaminated Fisheries Regulations*. Harvest of bivalves from a contaminated area destined for relay or depuration require a licence issued under the Regulations. DFO manages the issuance of these licences and a $100 fee applies.
The Canadian Shellfish Sanitation Program (CSSP) has an approved approach for licencing the collection and relay of bacteriological or chemically contaminated bivalve seed from prohibited areas. In the CSSP manual of operations "seed" is defined as a submarket size bivalve shellfish

requiring a minimum of six months to reach market size under normal growing conditions, that has been gathered from a lease site or directly from the wild, or grown in a hatchery, and transplanted or relayed to a private lease site or public shellfish bed for grow-out.
The CSSP partner agencies (DFO, Canadian Food Inspection Agency, and Environment Canada), as well as Health Canada, have conducted an analysis and recommended specified grow-out periods in approved growing waters as an acceptable decontamination plan for bivalve seed. Under this approach, shellstock spat and seed may be collected for grow-out from contaminated areas, including prohibited areas, by a licence issued under the MCFR providing that the seed or spat are moved to approved growing areas for an acceptable period of time prior to their final harvest and sale for human consumption. The acceptable grow-out period for seed collected within a bacteriologically contaminated prohibited area is a minimum of twelve months.
Additional information is contained in the CSSP Manual of Operations, Chapter 2, Section 2.3.6: http://www.inspection.gc.ca/food/fish-and-seafood/manuals/canadian-shellfish-sanitation-program/eng/1351609988326/1351610579883 .

3.7 Onboard Waste Containment

Disposal of human waste into waters where shellfish are harvested or adjacent to shellfish harvest areas creates unnecessary and potentially serious health risks for shellfish consumers. The Canadian Food Inspection Agency (CFIA), Environment Canada (EC) and DFO introduced changes to the Canadian Shellfish Sanitation Program (CSSP) shellfish harvesting and handling requirements in 2008. Every vessel involved in shellfish harvesting is required to have an approved human waste receptacle on board. Approved waste receptacles include: an impervious container with tight fitting lid, a portable a fixed toilet with holding tank or a Transport Canada approved marine sanitation device. In addition all persons on board a harvest vessel must sanitize their hands after using such devices. Under the *Pacific Aquaculture Regulations*, any vessel operating within an area licensed for aquaculture must have appropriate waste containment as outlined in the shellfish conditions of licence.

3.8 DFO Environmental Management Approach

The conservation of marine ecosystems and wild fish stocks is a priority for DFO. Together, the *Fisheries Act*, *Fishery (General) Regulations*, and the *Pacific Aquaculture Regulations* (along with other relevant legislation and regulations), form a comprehensive suite of management tools and along with ongoing science and research provide a framework for the effective management of aquaculture in BC.

This framework allows DFO to effectively manage potential environmental impacts related to aquaculture in both the marine and freshwater environment. Similar to the management of other fisheries, DFO aquaculture licences include specific conditions and mandatory requirements, which all licence holders must meet in order to operate. Many of these conditions focus on identifying and mitigating potential impacts on the environment.

DFO staff, including veterinarians, biologists and other aquaculture technical experts, support the implementation of the environmental management approach. These staff work closely with aquaculture resource managers, Fishery Officers, and the Science Branch in identifying and managing potential risks to the environment, while ensuring a high level of compliance with DFO Regulations and Conditions of Licence. DFO staff are responsible for:

- Identifying licence conditions aimed at strengthening environmental management;
- Conducting environmental audits and compliance evaluations for environmental performance;
- Reviewing and analyzing environmental and compliance data;
- Evaluating the effectiveness of the management regime.

DFO staff complete a comprehensive schedule of site visits and environmental audits each year to ensure that industry-generated information and reports are accurate. Staff also conduct targeted field operations to better understand potential environmental impacts related to aquaculture, and to support the ongoing development of improved mitigation measures and best practices.

3.9 DFO Shellfish Aquaculture Licensing

Shellfish aquaculture Conditions of Licence are designed to ensure the sustainable operation and development of the shellfish aquaculture sector. The basic template for a shellfish aquaculture licence, as well as the current general Conditions of Licence, can be found on the following website: http://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/shell-coq-eng.html. In addition site and/or area specific conditions may be added to licences where appropriate.

In 2016 DFO began to issue shellfish aquaculture licences on a multi-year basis. Currently most licences are issued for period of nine years. Prior to licence renewal, DFO undertakes a review of the Conditions of Licence, and where appropriate, makes modifications and improvements. The following sections provide an overview of the current shellfish Conditions of Licence.

3.9.1 General Licence Conditions

The face and introduction of the licence provide an overview of the species which are allowed to be cultivated under the licence, and provides definitions of terms used in the document.

3.9.1.1 Application and Licensed Species

The licence face provides an authorization for the conduct of the activity of aquaculture.

3.9.1.2 Site Management Plan

The licence-holder is required to have a site management plan which includes information about the licence-holder, the location and legal description of sites (including maps), a list of cultivated species, an overview of the types of culture taking place on the site, a description of the culture gear and physical structures, an overview of the licence area layout, and the estimated annual maximum production (or growing cycle production) of cultured shellfish (by species). Applicants must file a submission to change certain aspects of the site management plan.

3.9.1.3 Facility Installation and Inspection

The Conditions of Licence require that the operator ensure that their facility and structures (other than intertidal growing area) are capable of functioning as intended in the environment where they are located in the licenced area. Licence-holders are required to inspect their facility when it is first installed, and before any fish are introduced or transferred to the facility, any time structures or equipment are altered, as required, or at least once a year, to ensure that the integrity of the facility is maintained.

3.9.1.4 Transfer of Fish

Licence-holders are permitted to transfer live seed, spat, and juvenile shellfish (except geoduck, sea cucumber, sea urchin, or varnish clam) to or from the licensed facility, providing that:

- the species being transferred are authorized by the licence;
- the receiving area possesses a valid aquaculture licence for the species;
- conditions for transfer meet the restrictions outlined in the licence for each area and species;
- shellfish do not show any signs of any observable symptoms of diseases (listed in Appendix IV) or infectious agents of concern to the Introductions and Transfers Committee;
- all *Canadian Shellfish Sanitation Program* requirements are met.
- the shellfish does not come into contact with any growing waters while in transport.

The licence does not authorize the transfer of Geoduck, Sea Cucumber, Sea Urchin, and Varnish Clam.

In cases where these conditions are not met, licence holders are required to obtain a separate Introductions and Transfers Licence prior to the transport of the shellfish. These documents must accompany the transfer of any shellfish and be available for inspection by a Fishery Officer or Guardian.

3.9.1.5 Access to Wild Fish

The Conditions of Licence allow the licence-holder to collect spat of the licenced species within the licensed area. Licence holders may retain shellfish listed on the licence which have not been seeded in the licenced area when they are harvested along with cultivated licenced species.

3.9.1.6 Escapes or Releases

Licence-holders are required to take all reasonable precautions to ensure that they prevent the escape or release of cultured shellfish during periods when product is being transported.

3.9.1.7 Incidental Catch

With the exception of varnish (savory) clams, which are considered an invasive species and may be retained, anyone catching a fish incidentally not covered under this licence must return it to the water in the manner which causes the least harm.

3.9.1.8 Predator Control

Conditions of Licence require licence-holders to report immediately, upon discovery, any marine mammal entangled in gear (lice or dead) to DFO's Observe, Record, Report Line. If a marine mammal is observed entangled, but not dead, the licence-holder is also obliged to make a reasonable attempt to free the animal without harm. Within seven days of an incident a written report must be submitted to the Marine Mammal Reporting inbox.

All licensed aquaculture facilities are prohibited from using acoustical deterrents. If other types of predator exclusion devices are used on a licensed site, for example predator netting, the

licence holder is required to ensure that devices are constructed and maintained in a manner which avoids potential entrapment and injury to any fish or wildlife.

3.9.1.9 Protection of Fish Habitat

The *Fishery (General) Act* contains many provisions which outline protections relating to fish and fish habitat, and which apply to the conduct of aquaculture operations. In addition, licence holders are required to ensure that any Styrofoam is securely wrapped, and any flotation material that is degrading or no longer in use shall be removed from the marine environment and disposed of at a land-based facility.

Licence holders shall ensure that operations do not result in a build up of shell debris on the sea floor.

All equipment stored in the licenced area must be affixed to prevent it from moving off of the licenced area.

Operators shall not cause aquaculture refuse to be introduced into the environment in the course of the conduct of aquaculture activities.

3.9.1.10 Harvesting and Handling

The shellfish aquaculture Conditions of Licence require that all shellfish in containers, destined for market, be tagged in a proscribed manner. This section of the licence also provides guidance related to the wet storage of shellfish.

3.9.1.11 Measures to prevent the spread of Aquatic Invasive Species

This section of the licence outlines requirements relating to inspection, rinsing, and transport of product and equipment to prevent the spread of European Green Crab.

3.9.1.12 On-Board Waste Containment

All vessels within the licenced area are required to be equipped with a designated human waste receptacle. These receptacles must only be used for the purpose intended, secured, and located to prevent spillage or leakage and contamination of cultured shellfish. Receptacles must be emptied into approved sewage disposal systems and cleaned prior to being returned to the vessel.

3.9.1.13 Records

Shellfish aquaculture licence holders are required to maintain records related to a number of activities which occur throughout the growing cycle. These records must be produced upon request by a Fishery Officer or fishery guardian. Required records include, but are not limited to: the importation or introduction or transfer of shellfish; all shellfish harvested for sale; and site facility inspection and maintenance records.

3.9.1.14 Annual Aquaculture Statistical Report

Each year, prior to January 25th, licence holders are required to submit to the Department an Annual Aquaculture Statistical Report, which is outlined in the licence, and sent to all licence-holders. This report includes information on harvest for food sales, processing information, restocking and on growing information, and information on stock on-hand. This information helps DFO, the Province of BC, along with industry, First Nations, and other stakeholders, to better understand the activities of the shellfish aquaculture industry, and to analyze trends over time.

3.9.2 Additional Conditions by Species or Activity

3.9.2.1 General Culture of Bivalve Species

The shellfish aquaculture licence contains a number of conditions which relate to a list of bivalve species. These include the requirement that these species be processed in a federally registered plant and the requirement that beach and foreshore tenures be clearly marked as outlined in the approved Site Management Plan. There are prohibitions relating to proximity to floating living accommodation and marine finfish net pens. Requirements may also be in place relating to the *Management of Contaminated Fisheries Regulations*.

3.9.2.2 General Culture of Sea Urchin/ Sea Cucumber

This section of the licence outlines requirements and prohibitions relating to the seeding, transfer, and harvest of sea urchins and sea cucumber, including the requirement for the submission and approval of a Harvest Plan by DFO, and requirements related to Harvest Notification, and maintenance of a Sea Cucumber/ Sea Urchin Aquaculture Landing Logbook.

3.9.2.3 General Culture of Geoduck

Shellfish aquaculture licences contain specific requirements related to the cultivation of geoduck clams. This includes requirements related to seeding, the development of harvest plans, harvest notification, harvest container tags, and landing reports. DFO has recently approved an integrated management framework for geoduck, which applies to new and amended applications, and can be found at: : http://www.pac.dfo-mpo.gc.ca/aquaculture/management-gestion/2017/geoduck-panope/geoduck-panope-igmf-cgip-2017-eng.html .

3.9.3 Information and Requirements for Shellfish Aquaculture Licence Holder

3.9.3.1 Elements of a Shellfish Aquaculture Site Management Plan

This section outlines the requirements of a Shellfish Aquaculture Site Management Plan.

3.9.3.2 Standard Infrastructure

This section outlines the definitions of standard and nonstandard infrastructure, outlines sensitive habitats to be avoided, and notes the requirements for notifications relating to changes in infrastructure.

3.10 Management Priorities

In addition to the management tools and measures outlined above, DFO has identified a number of management priorities for shellfish aquaculture. These priorities have been identified based on the broader strategic priorities of the Department, science and ongoing environmental monitoring, as well as consultation and engagement with First Nations, industry, stakeholders and other levels of government.

In some cases, the Department has already initiated work to address these priorities. At the same time, further work is required and the Department will continue to engage with partners in order to work towards these management priorities over the coming months and years.

Management Priorities will be revised over time as work is completed and based on new science, monitoring and engagement with various interests. In particular, the SF-AMAC and bilateral aquaculture processes with industry and First Nations will be key vehicles for discussing and evaluating potential changes to our management approach.

The following management priorities and initiatives have been identified by the Department:

- New and Emerging Species
- Engagement and Outreach on Science & Research
- Modernization of the Canadian Shellfish Sanitation Program (CSSP)
- Public Reporting
- Regulatory Reform

The following section provides a brief overview of the management issue, DFO's current management approach and potential considerations moving forward.

3.10.1 New and Emerging Species

DFO is currently in the process of reviewing the process required for review when applicants seek approval for the culture of a species which has not yet been reviewed or approved for culture in British Columbia. The Department intends to work with industry in order to ensure that there is clarity relating to the requirements for science and research prior to the approval of licences for the culture of new species. At present, industry has communicated to DFO that this process lacks clarity and is lengthy and expensive. The Department will work with industry to develop a process which is more timely and transparent, while ensuring that the marine environment and other fish/ shellfish species are adequately protected.

3.10.2 Engagement Opportunities for the AMAC in Science and Research

The AMAC serves as an advisory body, providing advice to DFO on the management of aquaculture. Within the AMAC meetings from 2012 – 2015 members of the committees have indicated an interest in better engaging in the priority setting process for DFO's Science and research work. As well, the members of the advisory process have indicated that they are interested in understanding the linkages between Science and the framework for management and decision-making. Over the next two years DFO intends to further enhance work with the AMACs to develop processes for enhanced engagement in DFO Science priority setting, reporting out, and increased transparency in explaining the linkages between science and decision-making.

3.10.3 Modernization of the CSSP

Canadian Shellfish Sanitation Program partner agencies (DFO, Environment Canada, and the Canadian Food Inspection Agency) are working to balance requests for expanded service delivery from commercial aquaculture with the resources of the program. The three departments are working together to determine the best use of program resources to support economic opportunities for Canadians while maintaining appropriate health protection outcomes. A key element of the review will consist of evaluating each of the shellfish harvesting area to determine if the resources being applied are appropriate. Each harvest area will be evaluated based on indicators such as the volume and value of shellfish harvested, whether leases or licences have been issued, as well as whether invasive species or shellfish disease are present. An analysis will be conducted and stakeholder engagement will take place with groups such as the SF-AMAC.

3.10.4 Improvements in Public Reporting

A number of reports, and information including lists of licence holders and a copy of the generic licence are posted on the DFO web pages (http://www.pac.dfo-mpo.gc.ca/aquaculture/index-eng.html ; http://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/shell-coq-eng.html). The Department is interested in working with licence holders to improve the availability and relevance of shellfish aquaculture data posted on DFO web pages.

3.10.5 Improved Management of the Sector

Within government there is a constant process undertaken of consultation, science and research, and policy/regulatory change. As new information becomes available the management of the industry evolves. DFO Pacific Region is committed to working with First Nations, industry, and stakeholders to continue to improve the management of the shellfish aquaculture industry in a timely manner.

4. REPORTING ON RESULTS

DFO has committed to an open and transparent approach to the management of aquaculture in BC. In part, the Department works to achieve this objective both through the regular release of information reported by the aquaculture industry and data gathered through DFO's own environmental monitoring.

4.1 Public Reporting

Providing access to relevant and transparent information is an important component of aquaculture management in BC. The Conditions of Licence for aquaculture require licence holders to collect and submit information regular basis which relates to facility operations. In addition to the review of information submitted by industry, both DFO aquaculture staff and the Fishery Officers provide audit and compliance monitoring and inspections of licenced facilities. Publicly released information for shellfish aquaculture is available on the DFO website: http://www.pac.dfo-mpo.gc.ca/aquaculture/reporting-rapports/index-eng.html.

The following types of information are made publicly available:

- General Licence Information: The general shellfish aquaculture Conditions of Licence are provided on-line. More detailed conditions may be added to a licence on a site specific basis or within a particular geographic area.
- Licence Holder Information: Information includes licence holder/operating party name, site and general location, and species licensed for cultivation.
- Summary reports of transfer activities.
- Summary report of Conservation and Protection compliance assessment activities.

In addition, every aquaculture licence holder is required to submit an annual Aquaculture Annual Statistical Report which provides additional information relating to the performance of the aquaculture industry in BC.

4.2 Evaluation of Performance

DFO is committed to a process of adaptive and continuous improvement in the management of shellfish aquaculture. The SF-IMAP sets out guidance with respect to management objectives, management measures, and public reporting/industry performance. The management of aquaculture takes place within a broader framework of the objective of ensuring sustainability of the aquaculture industry by the Government of Canada.

As the shellfish aquaculture management framework continues to develop, information gained through reporting required by the Conditions of Licence, information compiled from the Aquaculture Annual Statistics Report, along with DFO and provincial agency-collected data, will be used to assist in ongoing reviews of both the performance of shellfish industry and the shellfish management framework.