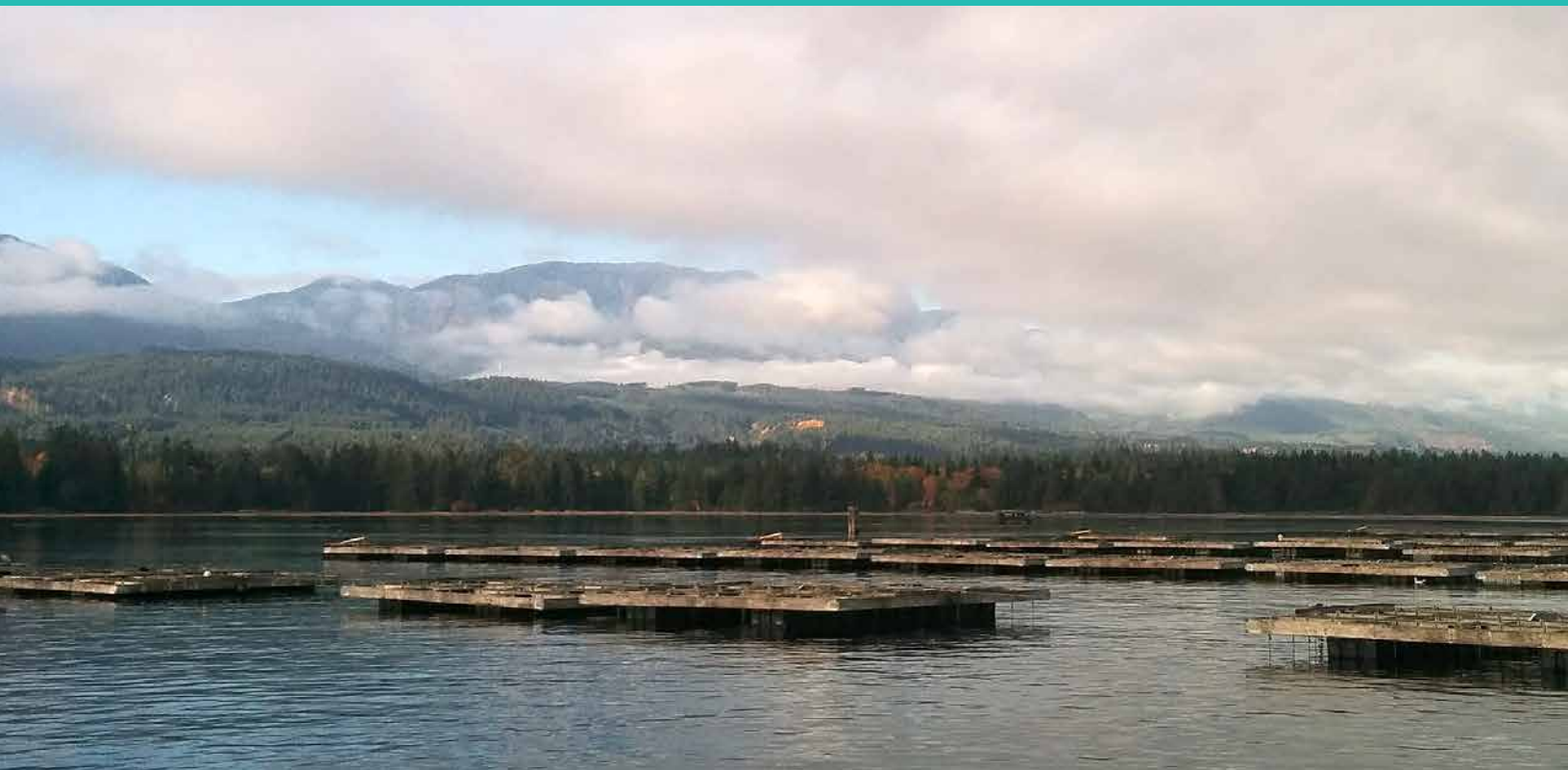


Regulating and Monitoring British Columbia's Shellfish Aquaculture Facilities

2018



**AQUACULTURE
MANAGEMENT**



Fisheries and Oceans
Canada

Pêches et Océans
Canada

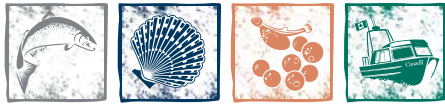
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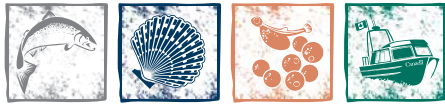


Introduction

Purpose

This report, *Regulating and Monitoring British Columbia's Shellfish Aquaculture Facilities*, provides an overview of the shellfish aquaculture industry in British Columbia, with a focus on Fisheries and Oceans Canada's (DFO) regulatory activities and the environmental and operational performance of the industry. Key issues facing the industry informed by an assessment of compliance with regulatory and administrative requirements, and areas for improvement are also highlighted.

DFO intends to produce this publication on an annual basis to enhance transparency around regulation of shellfish aquaculture and to increase the amount of information available to the public on the sector's performance as part of the Department's commitment to ensuring a sustainable, world-class aquaculture industry in Canada. Information presented on the Department's web pages, including public reports made available on the Government of Canada's Open Data portal (<https://open.canada.ca/en/open-data>), will be updated as new data is received and may differ from this report.



Executive Summary

Shellfish aquaculture in British Columbia accounts for a landed value of approximately \$20 to 25 million annually and is an important industry to the provincial economy. The majority of shellfish culturing locations are concentrated along the southern coast of BC.

Fisheries and Oceans Canada (DFO) is the lead regulatory authority for aquaculture operations. However, DFO works in partnership with other governmental agencies that manage other aspects of aquaculture such as food safety and water quality. Together, DFO and these other agencies manage the Shellfish Integrated Management of Aquaculture Plan, which outlines the management framework for shellfish aquaculture in BC. This plan ensures that shellfish aquaculture in BC operates sustainably and with minimal damage to fish and fish habitat.

DFO assesses compliance of the shellfish industry in a number of ways, including site audit inspections and desk audits of required reporting and record keeping. DFO initiated an audit of record keeping by licenced aquaculture facilities in 2019 covering the years 2017 and 2018. Twenty-five facilities (30%) did not meet record keeping requirements, and the audit uncovered other compliance issues from the examination of the records. This resulted in 16 files being referred to Conservation and Protection (C&P) for enforcement action through further investigation and issuance of warnings. Overall, reporting compliance improved in the shellfish aquaculture industry from 2017 to 2018.

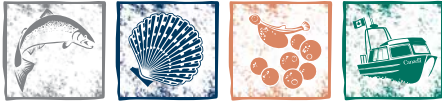
Key issues facing the BC shellfish industry for 2018 are traceability, norovirus outbreaks, and debris management.

In 2018, efforts to improve traceability have highlighted some gaps on which to focus in the coming years. DFO is committed to collaborating with its partners, First Nations and stakeholders to ensure the safe harvest of shellfish products by addressing these traceability challenges.

As bivalve shellfish are susceptible to accumulating contaminants, viruses, bacteria and toxins, they can be affected by changing ocean conditions. DFO works with multiple regulatory bodies on shellfish safety through the Canadian Shellfish Sanitation Program (CSSP). Significant norovirus outbreaks connected to the BC shellfish and herring industries occurred in 2017 and 2018, prompting DFO to lead engagement with the wide variety of stakeholders to produce an action plan for minimizing outbreak risk.

Shellfish aquaculture also generates a significant amount of plastic debris through derelict gear, unmaintained infrastructure and improperly wrapped or exposed Styrofoam. DFO is pursuing increased compliance through a variety of enforcement and licensing tools and is prioritizing management of this issue to help meet the Government of Canada's goal of zero plastic waste in the ocean. DFO also supports industry in clean up efforts through initiatives such as *Turn It In Week* and the *Big Beach Clean Up*.

DFO intends to focus on these key issues by working in collaboration with First Nations, other government departments and agencies, industry and other interested parties over the coming years in an effort to make progress on tackling these challenges. A variety of approaches will be used to support improvements including education and outreach, compliance and enforcement and pursuit of regulatory and/or policy changes as necessary.



Industry Overview

In British Columbia (BC), the aquaculture industry is primarily regulated and managed by Fisheries and Oceans Canada. DFO became the lead agency and began licensing aquaculture facilities in BC in December 2010. Aquaculture licences are issued under the authority of the *Fisheries Act* and the *Pacific Aquaculture Regulations* (PAR). These licences confer the authority to carry out aquaculture activities, including cultivation and harvest of fish and prescribed activities under conditions of licence. Key responsibilities of DFO staff include:

- Reviewing applications and issuing aquaculture licences
- Developing shellfish aquaculture conditions of licence
- Ensuring compliance with shellfish aquaculture conditions of licence and the *Fisheries Act*
- Issuing additional authorizations required for aquaculture operations (e.g. *Management of Contaminated Fisheries Regulations* (MCFR) licences for cleansing involving aquaculture facilities, Access to Wild Aquatic Resources as it Applies to Aquaculture licences, Introductions and Transfers licences)
- Consulting with First Nations, industry, and stakeholders
- Providing operational and policy support for the Canadian Shellfish Sanitation Program (CSSP)

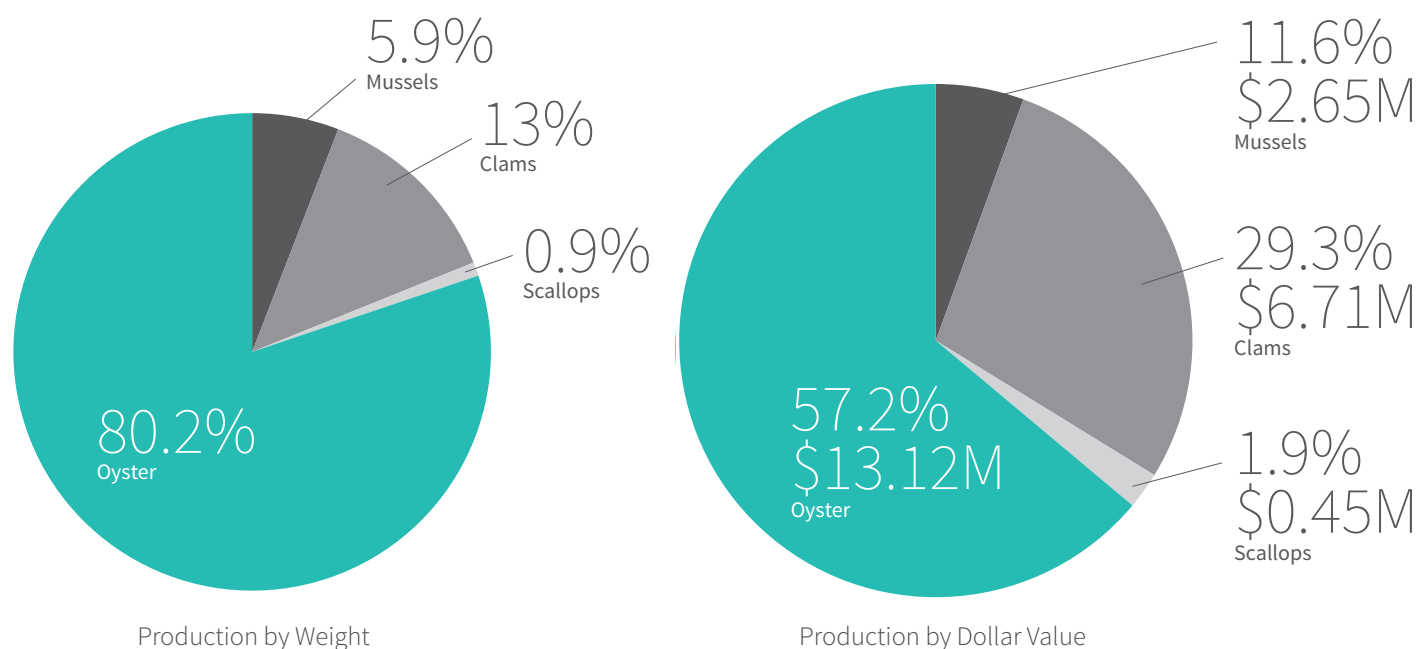
As the provincial government continues to play a role in managing aquaculture tenures in BC, DFO staff work closely with provincial counterparts to review applications for new aquaculture sites and activities through a harmonized licensing process.

Applications currently under review by the Department are available on the DFO website at: www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/index-eng.html#applications. Once applications are approved, details are added to the list of current shellfish aquaculture licence holders: www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/index-eng.html. Processors refer to this list to ensure that they are purchasing shellfish from a safe, legal source.

In 2018 there were 484 licensed shellfish aquaculture facilities. Overall production was down from 2017, when 9,200 tonnes of shellfish was produced with a landed value of \$22 million. In 2018 over 8,300 tonnes of product was produced, with a landed value of \$25 million. The Pacific oyster is the most widely cultivated shellfish in BC accounting for approximately 57% of shellfish aquaculture production, followed by clams (27%), mussels (11%), scallops (1.5%) and geoduck clams (2%). These production proportions have changed slightly since 2017 when 85% of production was Pacific oysters, 11% was clams, 3% mussels, and 1% scallops.

A summary of 2018 production data is presented in the chart on the following page.

Figure 1: BC Shellfish Aquaculture Production by Weight and by Dollar Value, 2018



Species Cultured in British Columbia

The commercial culture of Pacific Oyster in BC can be traced back to 1912 when it was first introduced from Japan. Since then, other species such as Kumamoto and European Oysters, Manila Clams, Japanese Scallops and their hybrids with native Weathervane Scallops and Gallo Mussels have been added to the inventory of shellfish species found on farms in BC. In addition to these species, a number of native shellfish species are also cultured, including Littleneck Clams, Western Blue Mussels and Geoduck Clams.

Shellfish culturists rely on access to healthy seed stock for their grow-out operations. While some culturists use natural set seed, in general most seed is produced at shellfish hatcheries where mature adults are spawned and their progeny reared to a size suitable for out-planting. At the present

time, there are only a few shellfish hatcheries in BC that are equipped to provide seed of various species. Almost 90% of the seed supply for the major species (oysters, Manila clams, scallops and mussels) currently cultured in BC is imported from certified hatcheries in other countries such as the USA and Chile.

The *Fishery (General) Regulations* prohibit the introduction and transfer of fish and shellfish into fish habitat or fish-rearing facilities without a licence. This is due to the potential for inadvertent disease transfer and potential negative impacts on native stock genetics and ecosystems.

Locations of Shellfish Aquaculture Facilities

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 North Coast, near Haida Gwaii and Prince Rupert. There is considerable First Nation interest in the expansion of shellfish aquaculture in areas of the North and Central Coast, but these opportunities are limited by a lack of water quality monitoring in these more remote areas. Shellfish can only be legally harvested from areas where water quality has been assessed by Environment and Climate Change Canada (ECCC) and deemed to be suitable for growing shellfish that are safe for human consumption.

Licensed shellfish aquaculture facilities as of December 31, 2018 are shown in Figure 2.

This map is also available on DFO's website at:
<http://www.dfo-mpo.gc.ca/aquaculture/bc-cb/maps-cartes-eng.html>.





Regulating

Roles of DFO and Other Agencies

While Fisheries and Oceans Canada is the lead federal authority for regulating aquaculture in BC, other federal departments and provincial agencies also have roles in the management and regulation of various aspects of aquaculture in BC. For example, Transport Canada (TC) is responsible for reviewing applications with respect to the protection of navigable waters, and the Canadian Food Inspection Agency (CFIA) has jurisdiction related to aspects of shellfish sanitation, fish health and processing, and health risks associated with the consumption of shellfish.

The Province of BC remains responsible for authorizing the occupation of provincial aquatic Crown land associated with aquaculture operations and ensuring the tenures are kept clean, safe and sanitary. 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, municipal zoning, administered by local governments, also applies in marine and foreshore areas.

Assessing Applications and Environmental Considerations

Fisheries and Oceans Canada is responsible for ensuring that the shellfish aquaculture industry operates sustainably. Similar to other development activities occurring in and around water, aquaculture projects have the potential to negatively impact fish and fish habitat. Therefore, DFO reviews all new aquaculture applications and amendments for potential impacts to fish and fish habitat. Applicants must determine and disclose whether the site is located in ecologically sensitive areas or impacts any species listed under the *Species at Risk Act*, or their critical habitats. Departmental biologists evaluate applications based on available information about fish habitats and wild fisheries and conduct site visits as needed. Should a review identify unacceptable risk of harm to sensitive or important habitats, applicants are required to employ mitigation measures. If the risk of serious harm to fish and fish habitat cannot be adequately mitigated, the application is rejected.

If licensed, an aquaculture facility is subject to conditions listed on its aquaculture licence to ensure the proper management of aquaculture activities including:

- Movements of fish between sites
- Escapes, predator control and incidental catch
- Protection of fish habitat and appropriate management of debris
- Harvest and handling instructions and requirements for shellfish heading to market, as well as food safety controls
- Measures to prevent the spread of Aquatic Invasive Species

- Onboard waste containment requirements
- Recordkeeping requirements
- Other species or site-specific conditions as appropriate

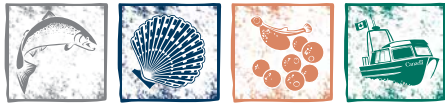
Shellfish aquaculture conditions of licence are available online at: <https://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/docs/licence-cond-permis-shell-coq/col-cdp-eng.html>

Shellfish Integrated Management of Aquaculture Plan

The Shellfish Integrated Management of Aquaculture Plan (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 scenarios where shellfish may be spawned and reared in land-based hatcheries at some stage of their life cycle prior to transfer to the marine environment.

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) comprises First Nations, shellfish aquaculture licence-holders, industry associations, environmental interests and local government, and is consulted in the development of the SF-IMAP.

The Shellfish Integrated Management of Aquaculture Plan is available for review online: <http://www.pac.dfo-mpo.gc.ca/aquaculture/management-gestion/shellfish-mollusques/background-contexte-eng.html>.



Education, Outreach, and Engagement

Fisheries and Oceans Canada consults with First Nations, stakeholders and Canadians on matters of interest and concern to them. Consultation and engagement play important roles in good governance, sound policy development and decision-making. Education, Outreach and Engagement activities consist of a suite of activities for promoting compliance can contribute to promotion of compliance, through strategies such as education, promotional campaigns, and engagement of partners and stakeholders. Educational activities are intended to raise awareness and understanding resulting in a more informed public and resource users and improving their ability to comply with regulatory requirements. A number of Education, Outreach and Engagement activities specific to Shellfish Aquaculture were conducted undertaken in 2018. These included public events, such as the BC Seafood Expo; established advisory processes; and, communication out on key topics to the shellfish industry through Fishery Notices and letters to all licence holders.

Public Outreach and Engagement

The BC Seafood Expo was held in Comox in June 2018. DFO staff attended a variety of sessions to network and engage with members of the BC seafood industry.

The BC Seafood Festival was also held in June 2018, where DFO staff delivered educational material and engaged with the public at an information booth. They educated on onboard waste containment and handed out Onboard Waste Containment buckets with sealing lids. Additionally, maps of the CSSP and openings/closures were distributed along with information on where to collect shellfish for personal purposes.

Indigenous, Stakeholder and Industry Engagement

Shellfish Aquaculture Industry Advisory Panel

The Shellfish Aquaculture Industry Advisory Panel (SAIAP) is the formal consultation process between DFO and industry to ensure regular communications on major policy, research and regulatory issues, as well as updates from industry on their priorities and business realities.

SAIAP meetings were held on March 20, July 17, and November 20, 2018. Key topics discussed were:

- Aquaculture Activities Regulations
- Fisheries and Aquaculture Clean Technologies Adoption Program
- First Nations Consultation
- Tagging, Traceability and Illegal Activity Associated with Bivalve Harvest;
- Integrated Environmental Compliance (including debris);
- Introductions and Transfers Process;
- Canadian Shellfish Sanitation Program
- Requirements for Wet Storage of Harvested Product;
- Norovirus Action Plan;
- Proposed Baynes Sound Precautionary Closures (Vessel Anchorages)
- Transport Canada Navigable Markings
- Shellfish Aquaculture Annual Report;
- Aquaculture Activities Regulations; and
- Shellfish Aquaculture Conditions of Licence
- Annual Aquaculture Statistical Reporting Requirements.
- Integrated Environmental Compliance

- Big Beach Clean Up
- Turn it in Week

Shellfish Aquaculture Management Committee

The SF-AMAC is a multi-stakeholder forum, which is, tasked with providing feedback to DFO on the coast-wide management of shellfish aquaculture and the development of the shellfish Integrated Management of Aquaculture Plan (SF-IMAP). Further information on the SF-AMAC, including the Terms of Reference and the SF-IMAP is available on the DFO consultation webpage: <http://www.pac.dfo-mpo.gc.ca/consultation/aquaculture/index-eng.html>.

SF-AMAC Meetings were held on April 26, 2018 and October 4, 2018. Key topics were:

- Terms of Reference
- Sector Check Ins
- Aquaculture Act
- Canadian Shellfish Sanitation Program
- Norovirus Action Plan
- Fisheries and Aquaculture Clean Technologies Adoption Program
- Geoduck Aquaculture
- Transport Canada Regulatory Update
- First Nations Fishery Council – Aquaculture Coordinating Committee
- Baynes Sound – Lambert Channel Ecosystem Forum and Advisory Committee
- SF-AMAC Working Group on Environmental Performance
- DFO/BCSGA Big Beach Clean Up
- Debris Action Plan
- Shellfish Science
- Conservation and Protection Compliance Priorities and Observations (traceability and illegal activity)

Fishery Notices

Fishery Notices are a key communication tool for the shellfish aquaculture industry and are available by e-mail subscription. DFO provides this service as a courtesy to their clients. Fishery notices are also available on the DFO Fishery Notice website. <http://notices.dfo-mpo.gc.ca>. Fishery Notices sent specific to shellfish aquaculture in 2018 were:

- July 18, 2018 — Transfers of Wild Shellfish to Aquaculture Tenures (Wet Storage)
- August 3, 2018 — Traceability Requirements outlined in the Shellfish Aquaculture Conditions of Licence

Letters to Industry

In June 2018, a letter outlining traceability requirements in the shellfish aquaculture conditions of licence and sample record logbooks was sent by registered mail to all shellfish aquaculture licence holders. The letter also included a translated offer to provide translation services for conditions of licence in seven languages.

In August 2018, a letter was sent to all licence holders advising of Turn it in Week, with a reminder of their responsibility to maintain compliance with the fish and fish habitat protection provisions of their licence and the *Fisheries Act*. In addition, a letter was sent to all of the Baynes Sound area licence holders encouraging them to be a good neighbour and participate in the Big Beach Clean-up.



Key Issues in Shellfish Aquaculture

Aquaculture is an evolving industry, and because of this, emerging issues can be uncovered that require action from DFO, industry, and other regulatory bodies. In 2018, key issues that DFO took action on and monitored include shellfish safety and traceability, environmental debris, summer mortalities, aquatic invasive species and climate change.

Shellfish Safety, Outbreaks, and Traceability in British Columbia in 2018

As filter feeders, bivalve shellfish are susceptible to accumulating contaminants, viruses, bacteria and toxins. Health and safety risks around consumption of bivalves are increased when they are harvested from areas that are contaminated. The consumption of contaminated bivalves can result in varying levels of illness and even death of those who consume the shellfish, depending on the nature of the contaminant, bacteria, virus or toxins to which the consumer is exposed. The widespread consumption of raw shellfish, particularly oysters, increases this risk as the heat of cooking can kill many (but not all) viruses and bacteria. DFO and other federal partners along with the industry have taken steps to monitor and implement practices to minimize risks associated with contaminated shellfish.

CSSP Program

DFO works with multiple regulatory bodies on shellfish safety. The Canadian Shellfish Sanitation Program (CSSP) is a national food safety program designed to minimize the health risks associated with the consumption of contaminated bivalve molluscan shellfish.

The Canadian Food Inspection Agency (CFIA) leads the coordination of the CSSP and is responsible for the control of handling, storage, transportation, processing and labelling of shellfish (including imports). The CFIA also coordinates the Marine Biotoxin Control Program under the auspices of the *Fisheries Act* and Regulations. It also liaises with foreign governments on matters relevant to shellfish sanitation and international trade.

Environment and Climate Change Canada (ECCC) is responsible for the monitoring of water quality in shellfish areas, for the identification and evaluation of pollution sources, and for the recommendations of the classification of shellfish harvesting areas based on water quality surveys.

DFO is responsible for the enforcement of closure regulations and enacting the opening and closing of shellfish areas under the authority of the *Fisheries Act*, as defined in the *Management of Contaminated Fisheries Regulations* (MCFR), and as recommended by CSSP program partners ECCC and CFIA.

DFO is also responsible for the control of the harvest of shellfish until the product enters a federally registered processing facility. Licences to fish for shellfish in marginally contaminated areas are issued under authority of the MCFR for both vacant crown foreshore and aquaculture facilities. Shellfish fisheries in contaminated areas have been licenced by Fisheries and Oceans Canada since the 1990s, in accordance with policies set out in the CSSP. Prior to processing for human consumption, these shellfish must be moved for cleansing, either in growing areas classified as Approved (relay) or to a tank of clean water in a processing facility (depuration) for a minimum prescribed period of time. Prior to issuance of a MCFR licence, a

decontamination plan must be approved by both the CFIA and DFO.

The CSSP is subject to external audit and scrutiny from countries receiving shellfish exports from Canada. For example, the United States Food and Drug Administration (USFDA) conducts full audits of Canadian growing areas, processing facilities, waste treatment plants and laboratories involved in testing shellfish every three years. Elements of the audit include compliance with aquaculture licence conditions, traceability of product and other harvest controls under the CSSP. Significant illness outbreaks, and uncertainty regarding handling, control of harvested product, or product traceability, may threaten bivalve shellfish exports to the USA or other countries. This would result in significant economic impacts to the shellfish industry nation-wide and negative impacts to Canada’s reputation as a trade partner.

PAR licence conditions pertaining to the CSSP/ control of harvest include tagging, record keeping, statistical reporting, requirement to land at a federally registered processing facility, product handling controls, and controls around floating living accommodation and seed in prohibited areas.

Norovirus Outbreaks

One of DFO’s priorities for this year was to minimize the potential for norovirus outbreaks due to the consumption of BC shellfish. Norovirus is a highly

contagious virus that can be transmitted through the consumption of contaminated raw oyster, among other methods of transmission. Norovirus particles can accumulate and persist in shellfish in the marine environment, which can lead to outbreaks if contaminated shellfish are sent to the food market.

A norovirus outbreak attributed to the consumption of raw oysters harvested from Baynes Sound (Pacific Fishery Management Area 14-8) occurred in 2018. The 2018 outbreak followed a coast-wide outbreak in 2017, which also included Baynes Sound. In 2018, there were more than 200 cases of norovirus in humans reported, with more than 100 of these cases occurring in the United States - Canada’s largest destination for exported oysters. The State of California issued a warning to consumers not to consume shellfish from BC, which impacted Canada’s reputation as having safe and high-quality products.

A foodborne illness outbreak investigation led by the Public Health Agency of Canada indicated the 2018 outbreak was likely associated with Strait of Georgia roe herring fishery vessels anchored in Deep Bay (Baynes Sound).

In an effort to minimize the risk of norovirus outbreak, DFO has led engagement with the British Columbia Shellfish Growers Association (BCSGA), the herring fleet, BC Ministry of Agriculture, CFIA, ECCC and TC, as well as the

Figure 3: Novovirus Closures 2018

Landfile	Reason for Closure	Date Invoked	Date Revoked
1402060	Norovirus Contamination	March 23, 2018	June 25, 2018
1411206	Norovirus Contamination	April 5, 2018	July 5, 2018
1400483	Norovirus Contamination	April 10, 2018	June 19, 2018
278757	Norovirus Contamination	April 13, 2018	July 5, 2018
1407063	Norovirus Contamination	May 3, 2018	July 3, 2018

herring and shellfish aquaculture industries to share interests and jurisdictional authorities, as they relate to vessel discharge, and produced an action plan for minimizing the risk of an outbreak occurring in future. Many of the actions centred on education, outreach, management and enforcement opportunities. DFO has been working in collaboration with other agencies that have the mandate and authority to manage vessel discharge.

Closures due to contamination are another method of risk mitigation (see Figure 3). DFO Fishery Officers played a key role in invoking and patrolling closures, communicating with industry, and participating in working groups and outbreak investigations in collaboration with the CFIA and local health authorities. Production reporting submitted to the Department as a requirement of conditions of licence helped inform the investigation of the causes of the norovirus outbreak.

Outbreaks associated with shellfish aquaculture products from BC have the potential to cause serious reputational damage to Canadian shellfish product and to limit access to export markets. Recent illness outbreaks (*Vibrio parahaemolyticus* and Norovirus) in BC attributed to consumption of raw/undercooked oysters have resulted in significant economic loss (an estimated \$9 million loss to oyster growers for the 2017 Norovirus outbreak), loss of consumer confidence in the product and loss of community identity for those communities where shellfish growing is prevalent.

Bivalve Traceability

Traceability is defined (for shellfish culture) as the capability to trace something back to its source growing waters. In some cases, it is interpreted as the ability to verify the history, location, or application of an item by means of documented recorded identification. Uncertainties in traceability can have significant impacts on domestic and international export markets because of the weakened control of harvested product and the

potential for possibly contaminated product to enter the food market. A number of conditions of licence within the marine shellfish aquaculture licence pertain to traceability of product, including seeding activities, movements of product during the growing cycle, and harvest of product to the point of landing. Traceability and assurance of legal harvest of licensed cultivated product of shellfish aquaculture product is critical for a number of reasons including:

- Human public health and safety (under the CSSP);
- Protection of wild shellfish populations; and
- Economic considerations, including maintaining exports of bivalve shellfish to foreign countries.

Environmental Performance, Abandoned, Lost or Otherwise Discarded Aquaculture Gear

Plastic waste and marine debris have emerged alongside climate change as a global environmental priority. In November 2018, environment ministers from across Canada, including the Minister of Fisheries and Oceans, agreed to work collectively toward a common goal of zero plastic waste. Plastic debris can have profound negative impacts on wild and cultured shellfish through the potential introduction of aquatic invasive species, harmful algal blooms, pathogens leading to disease, ingestion of plastics, and absorption of chemicals by shellfish destined for human consumption.

Marine debris can include plastics, concrete, metal and other non-natural materials, including errant netting and ropes that act as ghost fishing gear. Debris originates from a variety of sources including, but not limited to, the shellfish aquaculture industry. Examples from aquaculture activities include derelict gear, unmaintained infrastructure and improperly wrapped or exposed Styrofoam.



7

of the busiest
shellfish growing
areas were
covered

60

tonnes of debris
turned in total,
around **10% sent
to recycling**

Most of the debris consisted of Styrofoam and plastic material. The 2018 event builds on the success of 2017, when 72.5 tonnes of shellfish aquaculture related marine debris was turned in.

Fisheries and Oceans Canada considers marine debris and abandoned gear to be a significant environmental impact from the shellfish aquaculture sector in BC. The shellfish aquaculture licence conditions require licence holders to protect fish and fish habitat by taking measures to remove infrastructure and refuse from the marine environment. The Department has received numerous, ongoing complaints from local residents and environmental groups in areas where shellfish aquaculture activities are concentrated, citing poorly maintained or derelict gear from farms. The majority of aquaculture violation reports received via the DFO Observe, Record, Reporting line in 2018 continued to be related to shellfish aquaculture activities.

The Department is pursuing increased compliance through a variety of enforcement and licensing tools and is prioritizing management of this issue.

Turn it in Week

The *Turn it in Week* initiative was organized by DFO in partnership with the shellfish aquaculture industry. For a week in September 2018, shellfish farmers

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Figure 4: Turn it In Week 2018



were encouraged to dispose of any aquaculture-related debris on or around their aquaculture sites. Drop-off locations were set up throughout the South Coast areas and West Coast of Vancouver Island. These efforts significantly increased the amount of plastic and foam sent away for recycling.

The Big Beach Clean-Up

For the second year in a row, DFO's Aquaculture Management Division (AMD) and the BC Shellfish Growers Association (BCSGA) led a collaborative beach cleanup project of Baynes Sound, a beautiful and ecologically important waterway located in the Comox Valley, BC.

The AMD team was proud to join members of the community, provincial government partners, the

Figure 5: Photos of Shellfish Aquaculture Debris, 2018



Figure 6: Beach Clean Up 2018



Association for Denman Island Marine Stewards and the BCSGA for the Great Canadian Shoreline Cleanup from September 14 to 22. Over 8 days, 195 volunteers collected 46 cubic metres of debris weighing 2 tonnes. A full transport truck of plastic gear, rope and Styrofoam was sent to the non-profit organization Ocean Legacy, which converts debris into useable fuel and consumer packaging.

Summer Mortalities

Another issue of emerging importance for the BC shellfish industry is that of summer mortalities. Pacific Oysters (*Crassostrea gigas*) have been cultivated in BC for over a century and account for the majority of shellfish cultured in the province. However, over the last several decades, cultured Pacific Oysters throughout the province have been subject to periodic mass mortalities during summer months, consistent with Summer Mortality Syndrome events reported throughout the world. The summer of 2016 was a particularly difficult year for adult oyster survival with losses ranging from 50% to 90% on intertidal farms and 25% to 100% in suspended culture sites in BC.

The specific cause of the 2016 mortality event is unknown, but summer mortalities in Pacific Oysters in temperate climates are generally associated with elevated water temperatures, age class, reproductive state, low salinity events, and harmful algal blooms. It is likely that BC mortality events are attributable to a combination of these factors. DFO has partnered with industry to research this phenomenon through the Aquaculture Collaborative Research and Development Program (ACRDP).

Aquatic Invasive Species

The shellfish aquaculture industry also has the potential to propagate the spread of Aquatic Invasive Species (AIS). The deployment of gear and

product can increase available habitat for a number of AIS, especially fouling species like tunicates, while aquaculture-related movements have been shown to intentionally or unintentionally move species to new locations. This is a concern because AIS are a major driver of ecosystem change that can reduce biodiversity, alter community structure and function, diminish fisheries and aquaculture production, and impact human health and well-being.

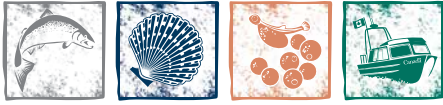
Currently, five high-risk marine species listed under the control schedule in the AIS Regulations in the *Fisheries Act*, are present in BC (violet tunicate (*Botrylloides violaceus*), golden star tunicate (*Botryllus schlosseri*), club tunicate (*Styela clava*), carpet sea squirt (*Didemnum vexillum*), and European green crab (*Carcinus maenas*)), each of which has the potential to be translocated with shellfish movements. DFO may impose regulations to constrain the distribution of these species, such as restricting movement of gear or product from AIS-infested waters, removal of AIS from product prior to movement from the farm site (through manual, biological, or chemical means) or instituting measures to ensure that potential AIS hitchhikers cannot escape into receiving waters. Reports from industry or the public can help refine the knowledge base of AIS distributions in BC.

Climate Change and Changing Ocean Conditions

Finally, climate change and changing ocean conditions have the potential to affect the aquaculture industry's economic sustainability and are already beginning to do so. Warmer water temperatures and changes in pH have already been reported on the BC coast over the past few years, leading to increased stress on marine finfish and shellfish, adverse effects on basic daily biological functions and growth, and reduced resistance to diseases.

For the shellfish sector, warmer waters have contributed to larger than normal toxic algae blooms and outbreaks of shellfish diseases that affect human health, such as *Vibrio parahaemolyticus*. Coastal areas are also experiencing signs of acidification of ocean waters and a reduction in the availability of calcium carbonate, which is a necessary ingredient in the formation and hardening of shells. For example, in recent years, some aquaculture operators have reported significant mortalities of juvenile shellfish from shell deformation, weak or brittle shells and darkening of the inside of shells attributed to increased ocean acidity. DFO and industry are collaborating through the Aquaculture Collaborative Research and Development Program (ACRDP) on a number of projects related to understanding the current and future effects of ocean acidification on shellfish aquaculture.

Climate change and changing ocean conditions mean that existing forecasting models, monitoring, and reporting tools may not be as reliable. Enhanced monitoring and research will be essential to adapt management approaches to new ecosystem dynamics.



Assessing Administrative Compliance

In order to help inform management decisions, DFO assesses compliance with regulations in a number of ways, including through site audits, recordkeeping, notifications, licence fees and reporting. Identifying compliance issues can lead to further action from DFO's Conservation and Protection (C&P) division.

Aquaculture Environmental Operations: Site Audit Inspections

DFO's field monitoring and audit program was established when regulatory authority of the aquaculture industry was assumed from BC in December 2010. From 2011 to 2015, key audit activities centred on facility inspections to assess compliance with licence conditions and tenure boundaries. A fieldwork team inspected every area of culture in BC, established a baseline of compliance for the shellfish aquaculture industry, and helped identify areas of poor performance requiring further attention.

In 2018, DFO C&P staff conducted 33 targeted inspections of south coast shellfish facilities to gauge compliance since the 2011 to 2015 inspection effort. The sites selected represented the top 33 non-compliant sites in these years. Of these, 31 continued to be out of compliance with fish and fish habitat protection provisions of their licence and the *Fisheries Act*. Of those 31 sites, DFO was able to compel some clean-up of 26 sites. As of December 31, 2018, 5 sites have not provided a sufficient response to their violations and their files remain open to enforcement follow-up.

Recordkeeping Requirements and Administrative Compliance

Under the shellfish aquaculture conditions of licence, licence holders are required to maintain a variety of records related to the licensed aquaculture activities. These records include details around imports, transfers, harvest and wet storage (storing shellfish prior to harvest), as well as a log of facility inspections and equipment maintenance. All of these records must be provided to DFO upon request.

DFO initiated an audit of record keeping by licenced aquaculture facilities in 2019 covering the years 2017 and 2018. Request for records were made of 84 facilities. The audit revealed the following information:

- Eighty-four facilities had records examined at the deadline for this publication.
- Thirty-six facilities (43%) were in compliance with Section 12, Conditions of Licence record keeping requirements on first submission of records.
- C&P corresponded with licence holders seeking clarifying information. Fifty-nine (70%) met recording keeping requirements after providing supplementary information.
- Twenty-five facilities (30%) did not meet Section 12 Conditions of Licence record keeping requirements.

The audit uncovered other compliance issues from the examination of the records. This resulted in 16 files referred to C&P for further investigation and 34 warnings issued.

- Thirty-two warnings were issued for failing to provide aquaculture records.
- Two warnings were issued for unauthorized transfer of varnish clams.

Geoduck, Sea Cucumber and Sea Urchin Notifications and Logbooks

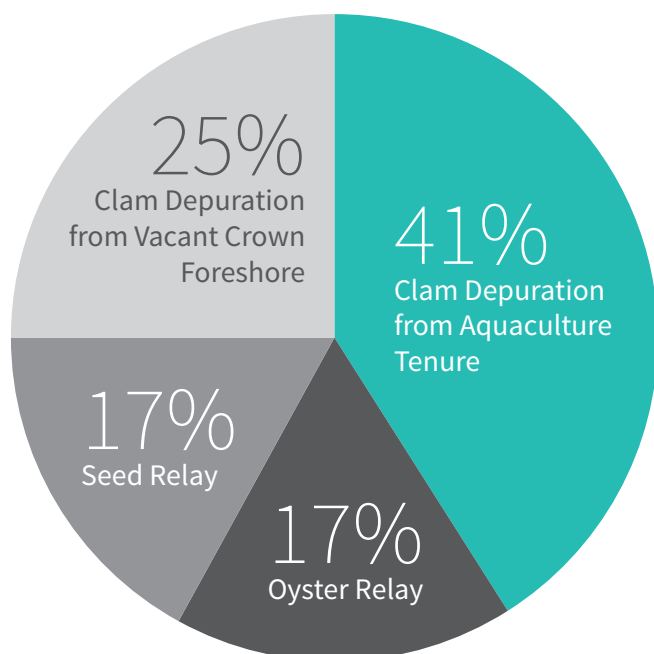
Fisheries and Oceans Canada has a number of conditions of licence pertaining to the harvest of geoduck, sea cucumber and sea urchin from aquaculture facility. Licence holders must submit a Harvest Notification form no less than 72 hours prior to a planned harvest (and submit an amended plan if harvest plans change) and a completed landing logbook no later than 24 hours following product landing.

Figure 7: Geoduck, Sea Cucumber and Sea Urchin Harvest Notifications and Landing Logbooks, 2018

#	COL	2017			2018		
		Total #	Non-Compliant		Total #	Non-Compliant	
			#	%		#	%
1	PART C. Additional Conditions by Species or Activity <u>3.3 Harvest Notification:</u> (a) The licence holder shall notify the DFO Radio Room (PACRadioRoomRHQ@dfo-mpo.gc.ca and DFO.PACRadioRoom-SallederadioPAC.MPO@canada.ca or (fax) 604-607-4156) and Aquaculture Resource Management (Shellfish.Aquaculture@dfo-mpo.gc.ca and DFO.AQSFAQSF.MPO@canada.ca or (fax) 250-754-0391) by facsimile or electronic mail no less than 72 hours prior to any Geoduck harvest , using a completed Aquaculture Harvest Notification Form (Appendix VI).	73	26	36%	53	14	26%
2	PART C. Additional Conditions by Species or Activity <u>3.5 Landing Reports:</u> (c) The licence holder shall scan and email or fax a copy of each day's Landing Logbook form(s) to the following location not later than 24 hours following product landing: Aquaculture Resource Management Fax: 250-754-0391 or by email to: Shellfish.Aquaculture@dfo-mpo.gc.ca and DFO.AQSF-AQSF.MPO@canada.ca.	65	47	72%	48	34	71%
3	PART C. Additional Conditions by Species or Activity <u>3.5 Landing Reports:</u> (b) The Geoduck Aquaculture Landing Logbook form shall contain: <ul style="list-style-type: none"> (i) Licence holder's name; (ii) DFO aquaculture facility reference number; (iii) Aquaculture facility location; (iv) BC land file number; (v) Pacific Fishery Management Area and Subarea; (vi) Harvest date; (vii) Vessel Name, VRN#, Landing Location and Vessel Operator for deepwater sites or Beach Supervisor name for intertidal sites; May 01, 2016 Shellfish Aquaculture Conditions of Licence Page 13 of 23 (viii) Number of Geoduck landed; (ix) Gross weight landed (including containers and liners); (x) Net weight landed; (xi) Trucking company details; (xii) Final destination (Registered Processing Plant or Destination Company); and (xiii) a signed declaration. 	65	21	32%	48	0	100%

DFO is also responsible for issuing licences that authorize harvest from contaminated areas and DFO controls the harvest of shellfish until the product enters a federally registered processing facility under the authority of the *Management of Contaminated Fisheries Regulations* (MCFR). Harvest of bivalves from a contaminated area destined for relay or depuration require a licence issued under the MCFR. DFO Aquaculture Management Division (AMD) manages the issuance of these licences, where aquaculture facilities are involved, upon approval of a plan for control of harvest by DFO and approval a product decontamination plan by CFIA. In 2018, DFO AMD issued 17% of MCFR licences for natural relay of contaminated seed, 17% of licences for natural relay of contaminated oysters, 25% of licences for natural relay of contaminated clams and 41% of licences for tank-based depuration of contaminated clams.

Figure 8: Percentage of Licences Issued under the Management of Contaminated Fisheries Regulations for 2018



Annual Aquaculture Statistical Report (AASR)

DFO requires aquaculture licence holders to submit information on their operations including harvest for food market sales, processing, sales for restocking or on-growing purposes, stock on hand, future plans and subtidal shellfish seeding activities. This information is provided through the Annual Aquaculture Statistical Report (AASR). Under the shellfish aquaculture licence conditions, licence holders are required to submit AASRs to the Department for each year of operation on or before January 25 of the following year.

The information in the AASRs is used by DFO for analytical and operational purposes. It helps the Government of Canada, the Province of BC, First Nations, industry, and stakeholders to better understand the activities of the aquaculture industry and to analyze trends over time.

In 2018, 327 of 484 required AASR reports were submitted on time for a compliance rate of 68% industry wide. This was an improvement from 46% in 2017.

Aquaculture Activities Regulations (AAR) Reports

The *Aquaculture Activities Regulations* (AAR) clarify conditions under which aquaculture operators may install, operate, maintain or remove an aquaculture facility; undertake measures to treat their fish for disease and parasites; and deposit organic matter under sections 35 and 36 of the *Fisheries Act*. The AAR allow aquaculture operators to do so within specific restrictions to avoid, minimize and mitigate any potential detriments to fish and fish habitat. The AAR also impose specific environmental monitoring and sampling requirements on the industry. Licence holders are required to submit annual reports on their activities no later than April 1 each year.

In 2017, 219 of 468 required AAR reports were submitted on time, for a compliance rate of 47% industry wide. 2018 numbers are not yet available.

Aquaculture Licence Fees

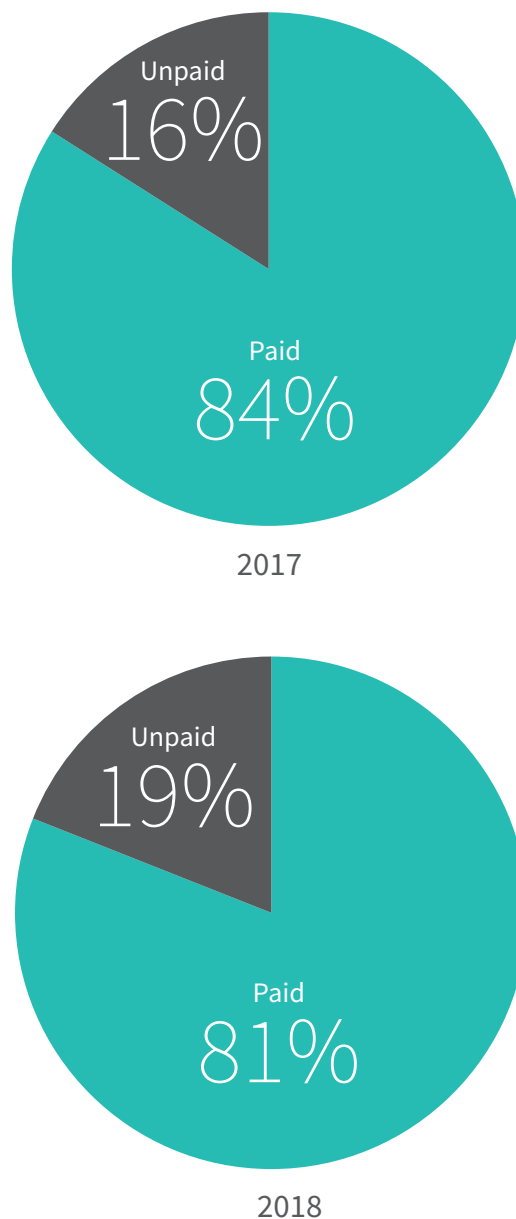
Aquaculture licence fees were implemented in 2015 to align with practices with other provinces, ensure consistency and limit any undue competitive advantage. In developing the proposed fees, DFO considered factors such as allowable production volume, size of operations and ease of administration.

Aquaculture licence fees and have two elements:

1. A flat fee applied to partially recover administrative processing and licence issuance costs. The flat fee is charged when a licence is issued for a new site, when licences are renewed and for changes of ownership.
2. An access-to-resource fee for use of the waters for aquaculture purposes. The access to resource fee is meant to reflect the impact and economic benefit from using the public resource to conduct business and collect revenues. The more of the resource being used, the higher the fee.

Shellfish Aquaculture User Fees	2017	2018
Access to resource fees (per hectare of the licensed area)	\$5.20	\$5.30
Administrative fee	\$104	\$106

Figure 9: Aquaculture Licence Fee Compliance by Site, 2017 and 2018



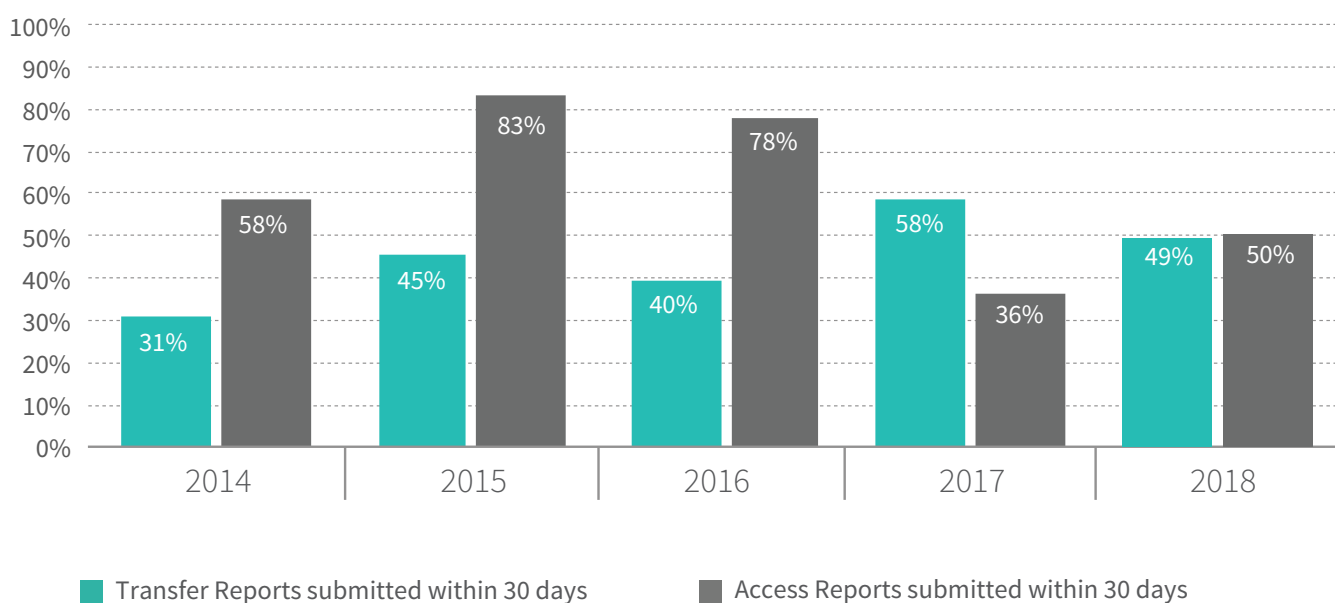
Introductions & Transfers and Access to Wild Aquatic Resources Licences

The joint federal/provincial British Columbia Introductions and Transfers Committee (BC ITC) is responsible for reviewing proposals for both aquaculture and non-aquaculture movements of shellfish into and between zones within BC, and makes science-based recommendations for acceptance or rejection of an application. The *National Code on Introductions and Transfers of Aquatic Organisms* provides the terms of reference for ITCs to assess proposals to move aquatic organisms from one water body to another. It also provides a consistent process for assessing the potential impacts of intentional introductions and transfers of aquatic organisms. Aquaculture Management, through the BC-ITC, also reviews applications and issues licences for Access to Wild Aquatic Resources for Aquaculture Purposes according to the *National Policy On Access to Wild Aquatic Resources As it Applies to Aquaculture*. This policy provides the aquaculture industry with access to wild stocks in a manner that is consistent with the department's sustainable management of those stocks.

While the long-term goal of the aquaculture industry is generally to minimize the requirement for access to wild stock for culture purposes by becoming self-sufficient, for species where the technology does not exist for hatchery production or the cost of hatchery production is prohibitive, access to wild stocks is essential to the development and expansion of the Canadian aquaculture industry.

Holders of all Introductions & Transfers and Access licences issued by the BC ITC must complete and submit a Record of Transfer Form to the Department no later than 30 days after the transfer activity. Figure 10 shows compliance with this condition between 2014 and 2018. In 2017 there were 7 Access licences issued for shellfish, and in 2018 there were 5. Most shellfish access licences are for Geoduck broodstock or Pacific oyster spat collection.

Figure 10: Shellfish Aquaculture Introductions & Transfers and Access Licences Compliance, 2014-2018





Enforcement

If a compliance issue is identified, the file is referred to DFO's Conservation and Protection (C&P) division.

C&P promotes and maintains compliance with legislation, regulations and fishery management measures to achieve the conservation and sustainable use of Canada's aquatic resources and the protection of species at risk, fish habitat and oceans.

DFO works closely with various federal, provincial, territorial and international organizations to execute its mandate. In carrying out the mandate, it also relies on the involvement of Indigenous fishing associations and groups, industry, recreational fishers and the public.

Fishery Officers and Fishery Guardians (biologists) are responsible for verifying compliance with the *Fisheries Act*, the *Fishery (General) Regulations*, the *Pacific Aquaculture Regulations* and the *Aquaculture Activities Regulations* as they pertain to the aquaculture industry in BC. Fishery Officers are responsible for investigating violations. Reports, complaints and discoveries of potential violations are recorded by Fishery Officers as "occurrences" and must be validated before an enforcement action is taken. The response is determined based on the severity of the violation.

There are a range of compliance and enforcement options available:

Education

Used to promote compliance and corrective measures.

Warnings

Issued to the violator and form part of the permanent compliance record for the individual or company. Follow-up inspections and corrective measures, such as site clean-up, may be required.

Charges

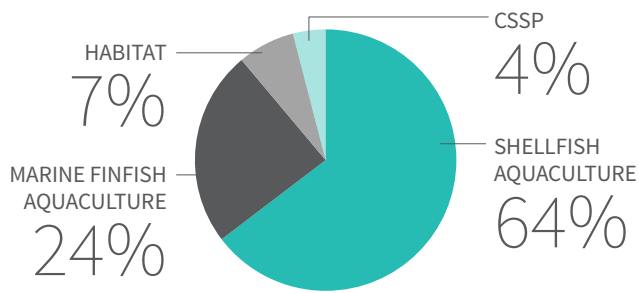
An individual or company may face formal charges laid in court for one or more violations. The *Fisheries Act* allows a maximum penalty of a \$100,000 fine and/or one year in jail for summary convictions and a \$500,000 fine and/or two years in jail for an indictable conviction. Extra costs may also be imposed and seized items may be forfeited.

Alternative Measures

These are measures outside the judicial process. In some cases, the accused will be offered the opportunity to engage in alternative measures or a restorative justice process instead of proceeding to court. Restorative justice is designed to address offending behaviour and conflict in a formally recognized dispute resolution process. Restorative justice may take place before or after charges are laid.

In 2018, C&P dedicated significant efforts towards the shellfish aquaculture sector. Specifically, shellfish traceability and the assessment of non-compliance and enforcement of the associated conditions of licence was made a priority for this year.

Figure 11: Officer Activity Profile, 2018



Recordkeeping Requirements Audit

As part of the recordkeeping audit that took place (see Assessing Compliance), a number of condition of licences violations were found including incomplete, fraudulent and non-existent record keeping. During the process of this audit, other condition of licence violations were also discovered including transfer of aquatic invasive species, unlawful wet storage and transfers and failing to land bivalves at Federally Registered Plants.

Public Complaints

A number of public reports were received by C&P staff, most of which were reported through the Observe, Record, Report line. In cases of reports associated with general aquaculture debris and environmental issues, the reports were forwarded to the Aquaculture Environmental Operations biologist team for tasking, tracking and follow up.

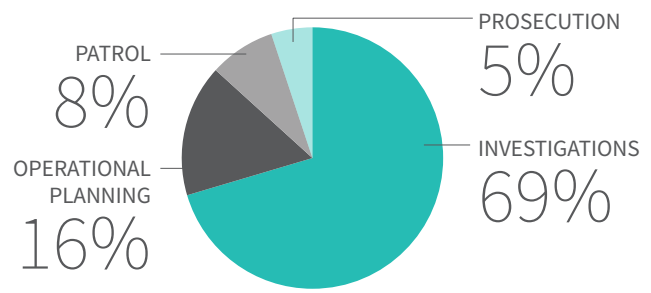
Shellfish Debris Inspections

C&P Fishery Officers worked jointly with the Shellfish Aquaculture Environmental Operations Fishery Guardians to conduct inspections on the fish and fish habitat related conditions of licence. As a result of these inspections, 100 separate violations were identified and 29 Warning Tickets were issued.

Other Investigations

Other investigations that were initiated in 2018 included violations associated with tagging, recordkeeping, unlawful harvest, AASR reporting, and unlawful wet storage and transfers of shellstock.

Figure 12: Enforcement Hours, 2018.



Summary of Violations, Charges and Convictions in 2018

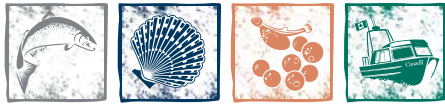
In 2018, 601 violations related to Shellfish Aquaculture in BC were identified, including.

- a) Violations:
 - a. s.12- 501
 - b. Fish and fish habitat protection - 100

From these violations, there are 7 charges pending and 100 prosecutions pending. C&P issued 33 warning letters regarding s.12 violations and 29 warning tickets regarding Fish and Fish Habitat Protection.

Convictions that occurred as a result of C&P investigations include:

- a) One investigation resulted in a conviction of Hollywood Oysters of Fishery (General) Regulations, failing to comply with conditions of licence (failing to tag), resulting in a \$10,000 fine.
- b) Miss Sunshine Oysters pleaded guilty to Pacific Aquaculture Regulations s. 7, cultivating shellfish without the authority of a licence, and was fined \$7,000 plus forfeiture of shellstock and equipment.
- c) Northwest Aquaculture pleaded guilty to Fishery (General) Regulations, failing to comply with conditions of licence (cultivate within 125m of floating living accommodation).



Looking Forward

DFO has increased its focus on the risks related to shellfish aquaculture and has identified several key areas of work to improve performance in the sector.

Environmental Protection

In 2019, the Department will continue to take actions to better protect fish and fish habitat from marine plastic debris and abandoned shellfish aquaculture gear. This environmental protection action plan will focus on:

- outreach and education
- collaborative projects with industry, First Nations and stakeholders
- continued site inspections of shellfish sites

The Fisheries and Aquaculture Clean Technology Adoption Program (FACTAP) was introduced in Budget 2017 and is investing \$20 million over 4 years to encourage Canadian fisheries and aquaculture industries to use clean technologies and measures to improve environmental performance. A list of projects funded by the Fisheries and Aquaculture Clean Technology Adoption Program is available on DFO's website: <http://dfo-mpo.gc.ca/aquaculture/business-entreprises/factap-patppa-funding-financement-eng.htm>.

Human Health and Traceability

As another priority, DFO is committed to collaborating with its CSSP partners, First Nations and stakeholders to ensure that product harvested from BC waters is safe for consumers.

To further support this objective, Conservation and Protection will be focusing on bivalve (e.g., oysters, scallops, clams and mussels) traceability and record keeping compliance issues by conducting detailed record audits. Field compliance inspections will also be conducted.

These issues involve multiple regulatory bodies, industry members, First Nations and the public. DFO will continue engagement with these groups to facilitate solutions to traceability challenges.