

Regulating and Monitoring British Columbia's Shellfish Aquaculture Facilities

2020



**AQUACULTURE
MANAGEMENT**



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Canada

Shellfish Aquaculture In BC

LOCATIONS OF SHELLFISH AQUACULTURE FACILITIES IN BC

The majority of shellfish aquaculture activity occurs along the southern coast of BC around Vancouver Island, with large concentrations in Baynes Sound and near the northern Gulf Islands. There are also a small number of farms located in the North Coast, near Haida Gwaii and Prince Rupert. In 2020, there were 486 licensed shellfish aquaculture facilities. Licensed shellfish aquaculture facilities as of December 31, 2020 are shown on the map on the next page. An updated version of this map is also available on DFO's website at: <https://www.dfo-mpo.gc.ca/aquaculture/bc-cb/maps-cartes-eng.html>.



Shellfish Aquaculture Facilities in British Columbia, 2020



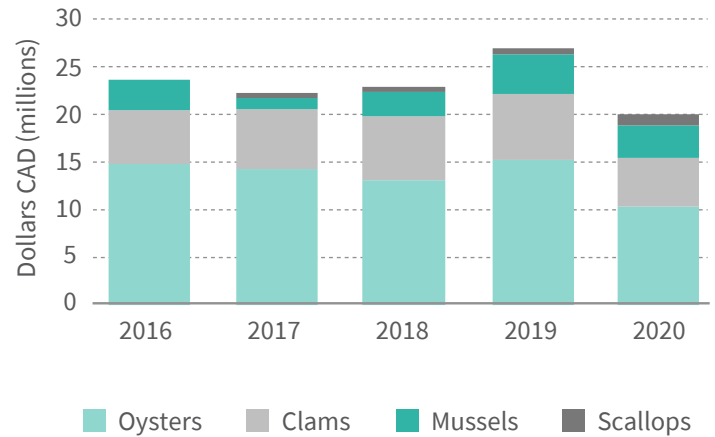
SHELLFISH PRODUCTION IN BC

Shellfish aquaculture continues to be an important leader in BC's economy. Pacific oysters are the primary shellfish species grown. Other native and non-native species such as Manila and littleneck clams, geoduck clams, scallops, and Gallo and Western Blue mussels are also produced.

In 2020, the shellfish aquaculture industry saw impacts from the COVID-19 pandemic ([The Daily — Aquaculture, 2020](https://www150.statcan.gc.ca/n1/daily-quotidien/211124/dq211124c-eng.htm) (<https://www150.statcan.gc.ca/n1/daily-quotidien/211124/dq211124c-eng.htm>)).

National aquaculture sales were down 16.8% and production fell 30.5% from 2019. The shellfish sector in BC produced a landed value of approximately \$20 million (6,700 tonnes) in 2020, compared to \$27 million (9,700 tonnes) in 2019.

Shellfish Aquaculture Sales, 2016–2020



clockwise from left: Geoduck Clam, Pacific Oyster, Manila Clams, Scallops, Mussels



REGULATING THE INDUSTRY

While Fisheries and Oceans Canada (DFO) is the lead authority for the management and regulation of aquaculture in BC, other federal departments and provincial agencies have roles. Transport Canada (TC), the Canadian Food Inspection Agency (CFIA), Environment and Climate Change Canada (ECCC), and Health Canada have jurisdiction related to aspects of the protection of navigable waters, shellfish sanitation, processing, exports, and health risks associated with the consumption of shellfish.

The Province of BC's Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) 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.

To conduct shellfish aquaculture in BC, the licence holder must have approvals and authorizations from Federal and Provincial agencies, including:

- Tenure Agreement (Province of British Columbia)
- Navigation Protection Program (NPP) Approvals (Transport Canada) – authorizations with respect to the protection of navigable waters

- Aquaculture Licence (Fisheries and Oceans Canada)
- Other approvals (i.e. BC Parks, Ministry of Environment etc.)

DFO staff work closely with the other agencies to review applications for new aquaculture facilities or amendments to existing facilities through a harmonized licensing process. Departmental biologists evaluate applications and assess the potential impacts to fish, fish habitats, and wild fisheries. Site visits are conducted as required.

Applications currently under review are available at: <https://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/index-eng.html#applications>.

If applications or amendments are approved, a new or amended aquaculture licence is issued under the authority of the *Fisheries Act* and the *Pacific Aquaculture Regulations* (PAR). These licences confer the authority to carry out aquaculture activities, such as the cultivation and harvest of fish, and include prescribed activities under conditions of licence.

A list of current shellfish aquaculture licence holders can be found at: [Current valid British Columbia aquaculture licence holders - Open Government Portal \(canada.ca\)](#).



Canadian Shellfish Sanitation Program

The Canadian Shellfish Sanitation Program (CSSP) is a national food safety program designed to minimize the health risks associated with the consumption of contaminated shellfish. Coordination of the CSSP program is led by the CFIA with support from DFO and ECCC. DFO regulates shellfish fishery openings and closings, and controls shellfish harvests until the product enters a federally registered processing facility.

A real-time map of shellfish harvest area closures can be found at <https://www.dfo-mpo.gc.ca/shellfish-mollusques/cssp-map-eng.htm>.

The CSSP is subject to external audit and scrutiny from countries receiving shellfish exports from Canada. 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. Significant illness outbreaks, uncertainty regarding handling and control of harvested product, or concerns related to 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 negatively impact Canada's reputation as a trade partner.

More details on the CSSP can be found at: <https://www.dfo-mpo.gc.ca/shellfish-mollusques/cssp-eng.htm>.

Bivalve Traceability

Bivalve traceability is the ability to trace shellfish aquaculture products back to their source. Uncertainties in traceability can have significant impacts on domestic and international export markets because of the potential for contaminated product to enter the food market. A number of marine shellfish aquaculture licence conditions pertain to requirements related to traceability of product, including seeding activities, movements of product during the growing cycle, and harvest of product to the point of landing. These elements include tagging, record keeping, reporting, and requirements to land harvest product at a facility licensed by the CFIA with the appropriate shellfish processing permission prior to sale for human consumption.



Traceability and assurance of the legal harvest of licensed cultivated 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 international export markets

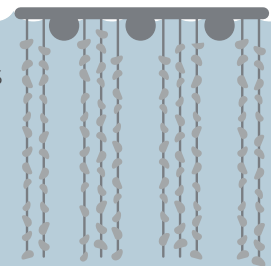
These issues involve multiple regulatory bodies, industry members, First Nations, and the public.

DFO will continue engagement with these groups to facilitate shared solutions to traceability challenges.

The [Bivalve Traceability Initiative and Action Plan](#) was a key focus for DFO's Aquaculture Management Division and Conservation and Protection Fishery Officers in 2020. The Plan includes targeted enforcement, records audits, and implementation of new management measures to address gaps and key findings.

HOW FARMED SHELLFISH PRODUCTS ARE TRACED

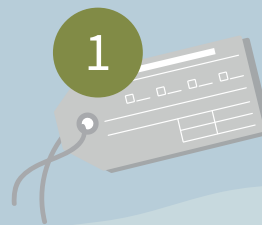
Under the aquaculture shellfish conditions of licence (AQSF COL)*, licence holders are required to maintain a variety of records relating to their activities: imports, transfers, harvest, wet storage, facility inspections, and equipment maintenance. Licence holders are responsible for understanding and adhering to the applicable regulations and reporting their activities to Fisheries and Oceans Canada (DFO).



There are additional notification and reporting requirements for harvests occurring under the authority of the Management of Contaminated Fisheries Regulations



Destined for market sale.
(Wet storage: other legislation may apply)



TAG
*Prior to leaving licensed area
AQSF COL s.9*



LOGBOOK
*Complete within 24 hours
of all movement of product
AQSF COL s.12.2*

Use of a buyer/receiver is optional.
BC Fish and Seafood Regulations apply



BUYER/RECEIVER

*Fisheries Act
s.61 records*



FEDERAL PROCESSING PLANT

COL Part C s.1.1(b)



STATISTICAL REPORT (AASR)
*Submit annually
by January 25
COL 13.1*

Enforcement & Compliance

Fisheries and Oceans Canada (DFO) works closely with other regulatory bodies to ensure the protection of fish and fish habitat, promote and maintain compliance with legislation and regulations, and to support the conservation and sustainable use of Canada's aquatic resources. DFO also collaborates with Indigenous groups, industry advisory committees, recreational fishers, and the public.

Fishery Officers and Fishery Guardians are responsible for conducting inspections and 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. Many of DFO's aquaculture biologists are designated as Fishery Guardians, and thus work closely with Fishery Officers. If a significant compliance issue is identified, the file is referred to DFO's Conservation and Protection (C&P) division who are responsible for investigating violations, issuing warnings, or recommending charges for prosecution when appropriate. Due to the COVID-19 pandemic, in 2020 DFO Fishery Officers and Fishery Guardians had to adapt the way in which they conduct inspections in order to adhere to public health guidelines.

When a violation is identified, the response is determined based on the severity of the violation. There are a range of compliance and enforcement options available, including education and outreach, warnings, charges, and restorative justice.

EDUCATION & OUTREACH

DFO works with licence holders to ensure understanding of

CONDITIONS OF LICENCE

through

WRITTEN + VERBAL COMMUNICATION

.....

CONFERENCES

.....

SEMINARS

.....

WORKING GROUPS

WARNINGS

Minor violations may lead to warnings and form part of an individual's/company's

PERMANENT COMPLIANCE RECORD

Follow-up inspections and corrective measures, such as site clean-up, may be required.

CHARGES

An individual/company may face formal charges laid in court for one or more violations.

The *Fisheries Act* allows a maximum fine of

\$100,000

and/or

**TWO YEARS
IN JAIL**

for an indictable conviction.

Extra costs may also be imposed and seized items may be forfeited.

RESTORATIVE JUSTICE

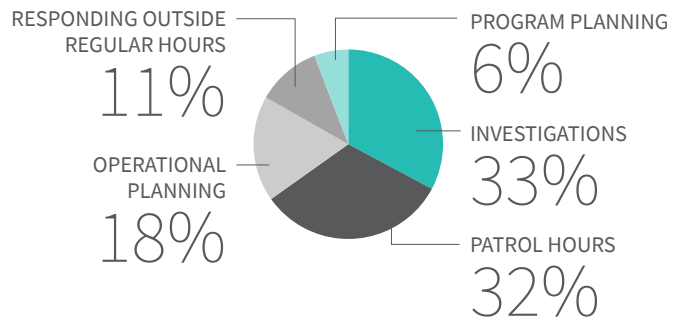
**AN
ALTERNATIVE
TO THE
TRADITIONAL
COURT
SYSTEM**

Once a licence holder has taken responsibility for charges, restorative justice can take the place of trial or conviction. It often involves the community and is an approach that personalizes the offence by having victims and offenders mediate a restitution agreement.

WARNINGS, INVESTIGATIONS, AND CONVICTIONS

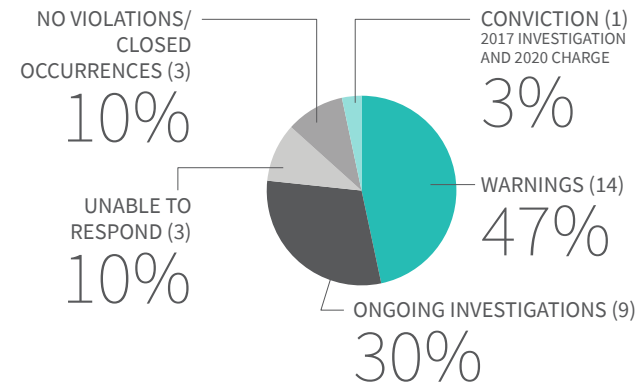
In 2020, C&P Fishery Officers continued to dedicate significant efforts towards addressing compliance concerns in the shellfish aquaculture sector, with an emphasis on product traceability and debris management. While non-compliance rates of approximately 15% were observed, monitoring and enforcement engaged 65% of all C&P hours to address the concerns.

C&P Officer Hours, 2020



Investigations in 2020 were related to: (1) poor tagging practices and record keeping, (2) unlawful transfers, harvests and wet storage, (3) annual reporting requirements, and (4) habitat related violations. Approximately half of investigations resulted in warnings, and one conviction was achieved. Several significant investigations were complex and will remain ongoing past 2020. Some charges were put on hold by provincial court houses due to the Covid-19 pandemic.

C&P Occurrences and Investigations, 2020



Example: Boat-to-plate Traceability

In recent years, significant investigation efforts have been invested in product traceability and illegal harvesting. DFO, Health Canada and Canadian Food and Inspection Agency (CFIA) worked collaboratively on a boat-to-plate traceability investigation. This focused on the prevention of seafood fraud and illegal fishing to keep Canadian fisheries and aquaculture safe and globally competitive. In 2020, an aquaculture operator was found guilty of failing to maintain records, correctly tag harvested product, and provide accurate harvest data. The licence holder was fined \$5,000 and received court issued probationary conditions of conduct.

For more information about regulatory requirements relating to traceability visit: <https://inspection.canada.ca/food-safety-for-industry/traceability/traceability/eng/1522294721005/1522294781171>.

Example: Oyster Spat Access Fishery

Following the 2019 suspension of the issuance of DFO access licences for oyster spat, in 2020 DFO senior management and C&P issued a notice to industry indicating that a full clean-up of the affected areas (Pendrell Sound) would be required prior to the spat season. However, the volume of debris had not satisfactorily decreased, resulting in an additional letter being issued to notify shellfish aquaculture licence holders that access to oyster spat was being suspended indefinitely in all areas of the Pacific Region, including Pendrell Sound, as DFO continues to address ongoing debris and environmental concerns.

Example: Tagging Non-Compliance

In 2020, an aquaculture operator was found guilty for harvesting without a licence under the *Management of Contaminated Fisheries Regulations* (MCFR). The licence holder was fined \$10,000.

Observe Record Report (ORR) Hotline

Suspected violations or environmental issues related to shellfish aquaculture facilities should be reported to DFO through the ORR hotline by:

Visiting online: <https://www.pac.dfo-mpo.gc.ca/fm-gp/rec/ORR-ONS-eng.html>

Calling Toll Free: 1-800-465-4336

Emailing: DFO.ORR-ONS.MPO@dfo-mpo.gc.ca

In recent years, reports have primarily involve derelict or lost gear, debris on or near aquaculture sites, issues with unmaintained netting and predator deterrent equipment.

RECORD KEEPING AND ADMINISTRATIVE COMPLIANCE

Licence holders are required to maintain a variety of records related to aquaculture activities.

These records must be provided to DFO upon request.

Record keeping requirements include details of:

- imports, transfers, and harvests
- wet storage (storing shellfish prior to harvest); and
- a log of facility inspections and equipment maintenance.

A record keeping audit related to product movements was initiated in 2019, continued during 2020, and will be ongoing through 2021-2022. In 2020, the audit examined 2018-2019 licence holder records for 49 shellfish facilities, results of which are presented below. Review of 2020 records from a remaining 21 facilities will be ongoing in 2021.

47%

of the facilities were in compliance with the **conditions of licence product movement** and **record keeping requirements** on first submission of records

Where initial submissions did not meet requirements, C&P corresponded with licence holders seeking clarifying information.

69%

met recording keeping requirements after providing supplementary information

31%

of facilities did not meet the **conditions of licence record keeping requirements**

15 FACILITIES

that did not meet requirements were sent a demand for 2019 records, in order to assess whether compliance had improved:

- **Ten** (67%) of these facilities submitted records which **met requirements**;
- **Five** (33%) facilities **did not meet requirements** for record keeping. These five facilities were referred to Aquaculture C&P for follow up

4

facilities did not keep records of product movements

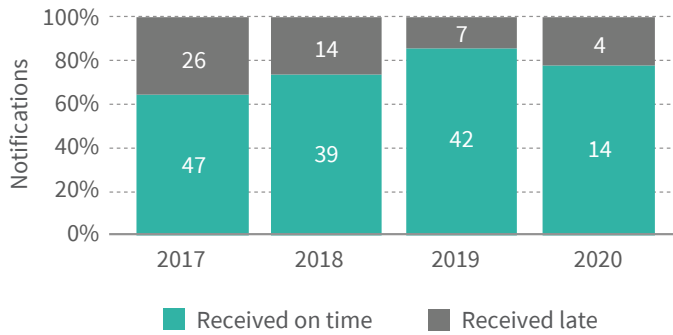
THESE AUDITS RESULTED IN THE ISSUANCE OF 10 WARNING LETTERS, REFERRAL OF 11 RECORDS TO AQUACULTURE C&P AND THE DETECTION OF 21 VIOLATIONS.

Geoduck, Sea Cucumber, and Sea Urchin Notifications and Logbooks

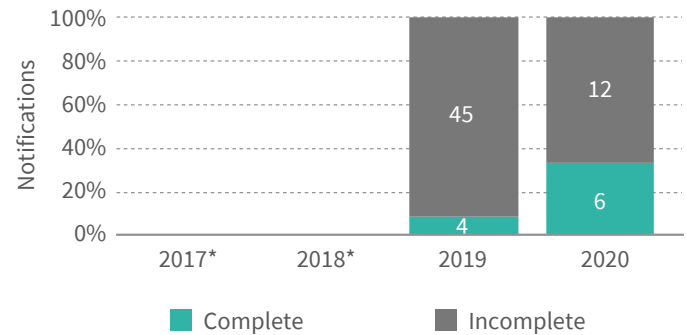
DFO has a number of conditions of licence pertaining to the harvest of geoduck, sea cucumber, and sea urchin from aquaculture facilities. Licence holders with approved harvest plans must submit a harvest notification form no less than 72 hours prior to a planned harvest and submit an amended plan if required.

Harvest Notifications Submitted to DFO, 2020

Compliance by Submission Timing



Compliance by Submission Content

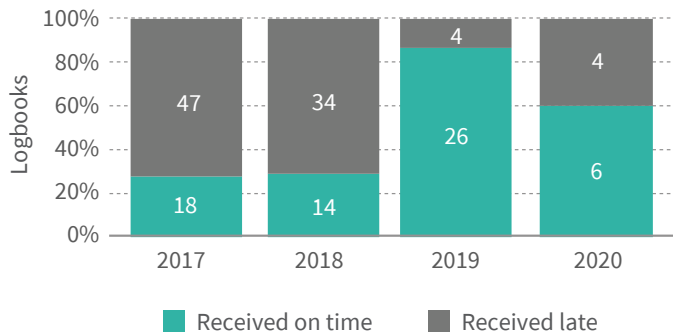


*no data available for 2017-2018

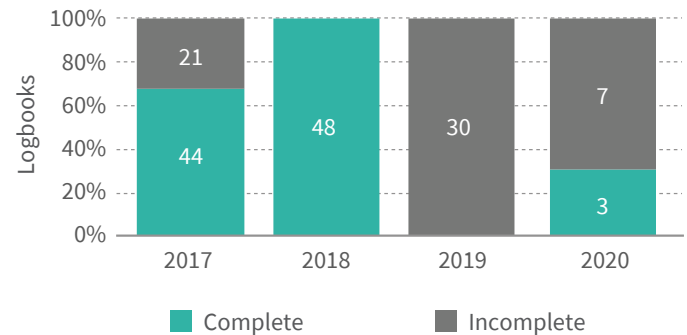
In addition, a completed landing logbook must be submitted no later than 24 hours after the product reaches the processing facility.

Landing Logbooks Submitted to DFO, 2020

Compliance by Submission Timing



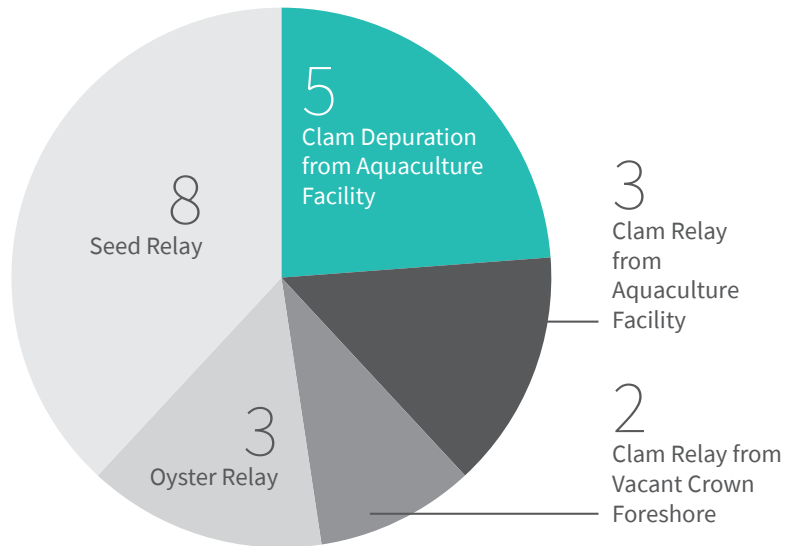
Compliance by Submission Content



Management of Contaminated Fisheries Regulations Licence Notifications

When shellfish are harvested from a contaminated area they can be cleaned by relaying to a non-contaminated beach or area (wet storage), or by placing in a tank of clean water in a processing facility (deuration) for a minimum prescribed time. These movements require a licence issued under the *Management of Contaminated Fisheries Regulations* (MCFR) and a decontamination plan must be approved by both CFIA and DFO. When aquaculture facilities are involved, DFO's Aquaculture Management Division (AMD) manages the issuance of these licences and controls harvest until the product enters a federally licensed processing facility under the authority of the MCFR.

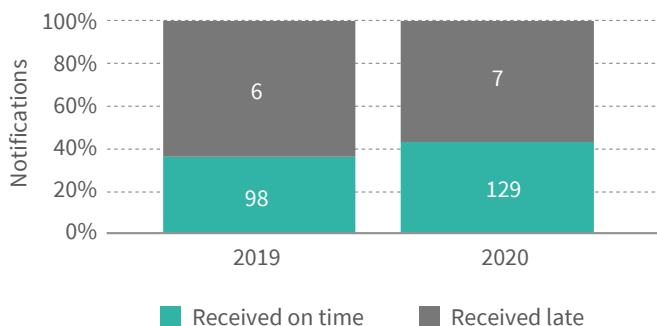
Number of Licences Issued Under the MCFR, 2020



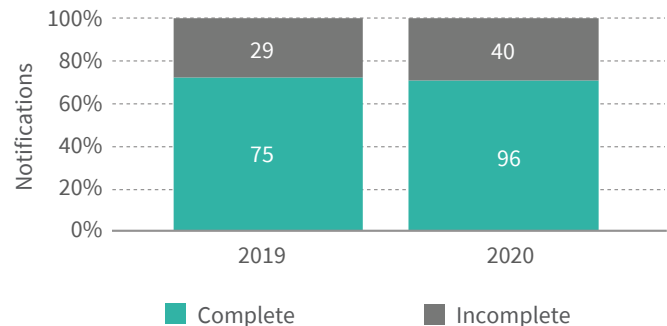
With the exception of most facilities licensed for seed relay, licence holders must submit a notification to DFO a minimum of 24 hours before a planned harvest. This notification provides important information on the source, destination, and timing of harvests from contaminated areas. In 2020, 136 notifications were submitted for harvests under the MCFR.

MCFR Notifications Submitted to DFO, 2020

Compliance by Submission Timing



Compliance by Submission Content

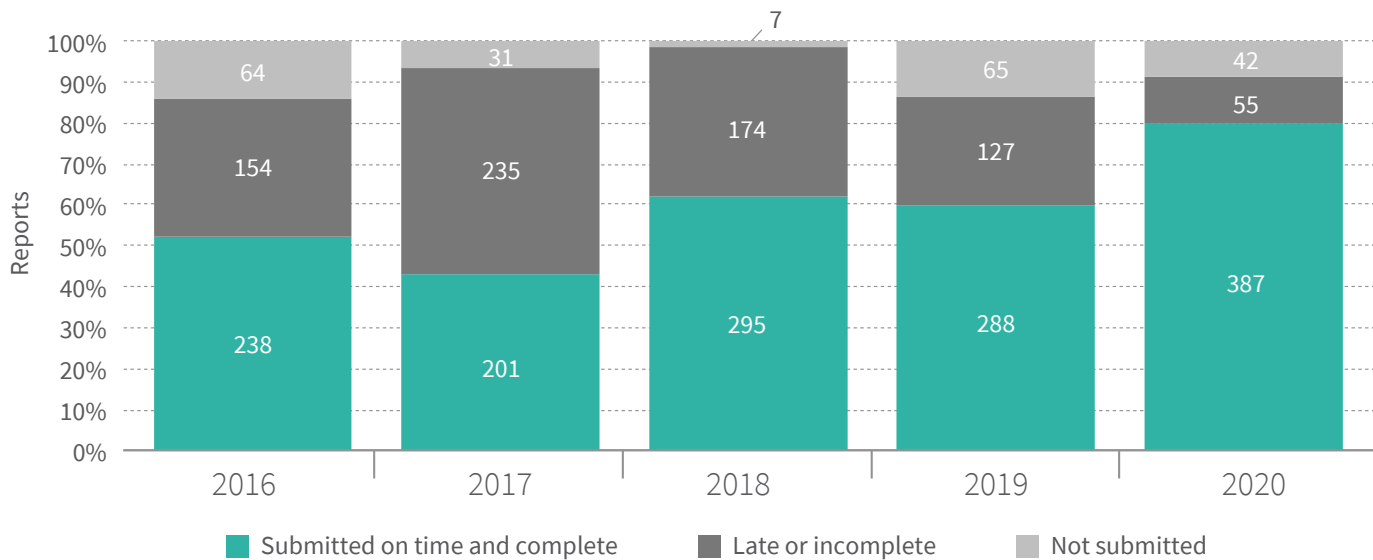


Annual Aquaculture Statistical Report (AASR)

Each year, aquaculture licence holders must submit annual reports 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) which assists DFO, the CFIA, the Province of BC, First Nations, industry, and stakeholders to better understand the activities of the aquaculture industry and to analyze trends over time. This contributes to sustainable management of the industry, supporting policy development, and contributing to decision making processes.

AASR reports must be submitted on or before January 25 of the following year. For the 2020 reporting year, 20% of AASRs for shellfish aquaculture facilities were either not submitted, submitted late or were incomplete. Aquaculture management biologists worked with C&P Fishery Officers to review non-compliance with this condition of licence. C&P Fishery Officers are working on violation files resulting from late, missed or improper reporting, some of which may result in court prosecutions. The number of convictions will be available in future reports.

AASRs Submitted to DFO, 2016-2020



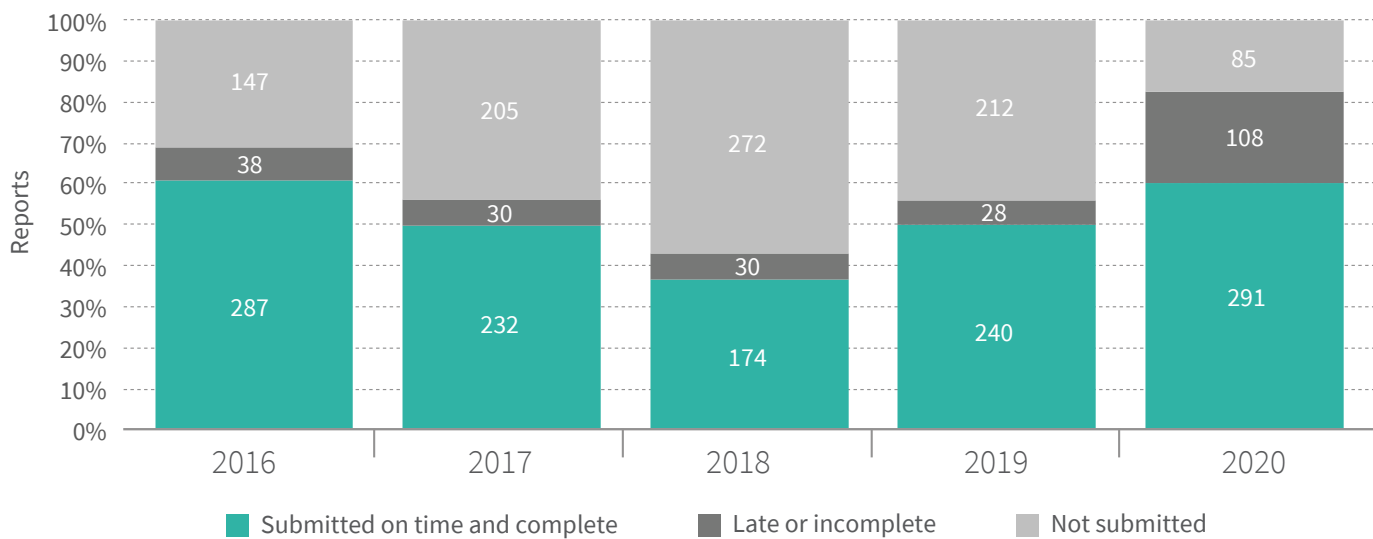
Aquaculture Activities Regulations(AAR) Reports

The national *Aquaculture Activities Regulations* (AAR) clarify conditions across Canada 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. Licence holders are required to submit annual reports on their activities no later than April 1st each year.

For more information on the AAR, please visit: <https://www.dfo-mpo.gc.ca/aquaculture/management-gestion/aar-raa-eng.htm>.

AAR Reports Submitted to DFO, 2016-2020



Aquaculture User Fees

Aquaculture licence holders must pay annual licence fees, including:

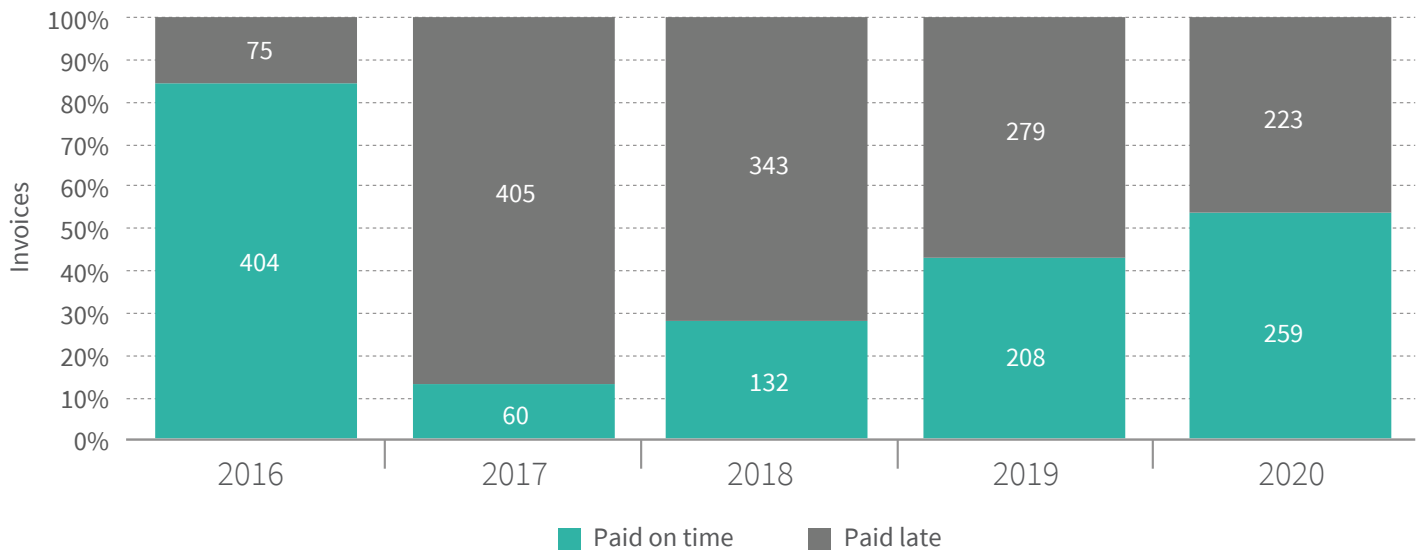
1. A **flat administrative fee** applied to partially recover administrative processing and licence issuance costs. The flat fee is charged when a licence is issued for a new site, when licences are renewed, and for changes of ownership.
2. An **access-to-resource fee** for use of the water for aquaculture 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. Fees are charged based on the size of the aquaculture tenure.

Licence holders must pay applicable fees before the due date issued on the invoice.

For more information on shellfish aquaculture licensing in BC, including user fees, please visit: <https://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/index-eng.html> or contact the Pacific Aquaculture Licensing Unit by email at fishing-peche@dfo-mpo.gc.ca.

Aquaculture Licence Fees Paid to DFO, 2016-2020



Introductions & Transfers and Access to Wild Aquatic Resources

Almost 90% of the seed supply for the major species (oysters, Manila clams, scallops, and mussels) are imported from certified hatcheries in other countries such as the USA and Chile. To prevent inadvertent disease transfer and potential negative impacts on native stock genetics and ecosystems, the *Fishery (General) Regulations* (FGR) prohibit the introduction and transfer of fish and shellfish into fish habitat or fish-rearing facilities without a licence. DFO reviews and approves all introduction and transfer requests according to the National Code on Introductions and Transfers

of Aquatic Organisms and section 56 of the FGR. This regulatory process ensures that all shellfish movements are done in a safe and responsible manner to protect wild fish and fish habitat.

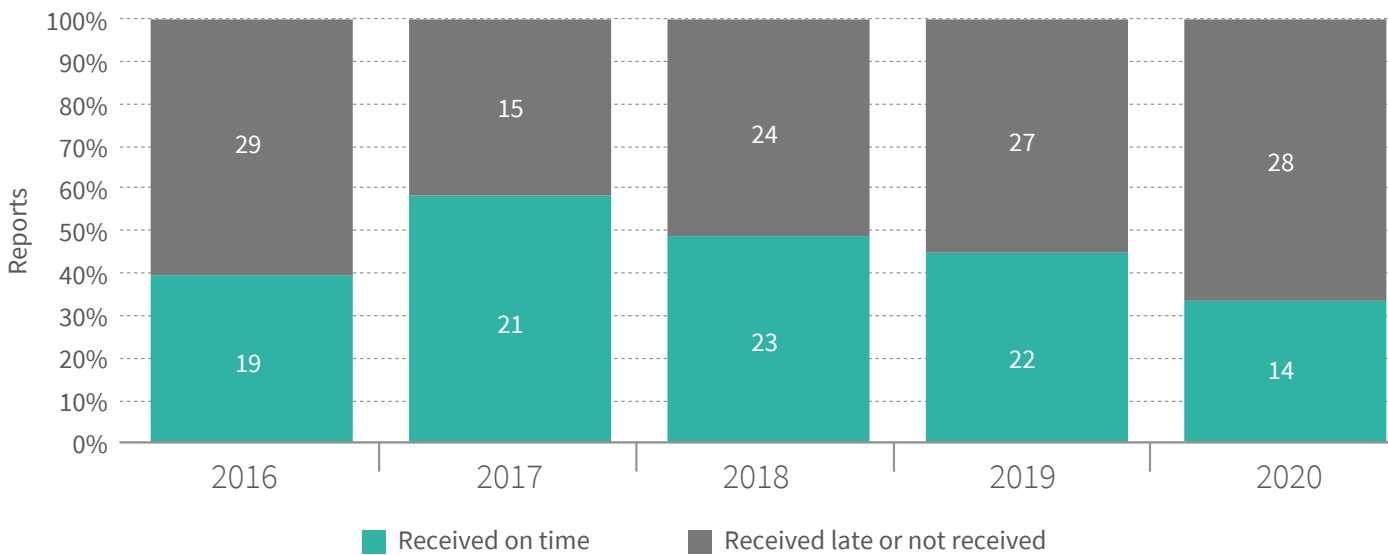
The joint federal/provincial British Columbia Introductions and Transfers Committee (BC ITC) is responsible for reviewing proposals for both aquaculture and non-aquaculture related movements of shellfish into and between zones within BC and makes science-based recommendations for acceptance or rejection of an application.

Similarly, through the recommendations of the BC ITC, DFO's AMD also reviews applications and issues licences for access to wild aquatic resources for aquaculture purposes. While the long-term goal of the aquaculture industry is to minimize the requirement for access to wild stock for culture purposes, for species where hatchery production technology does not exist or where the cost of hatchery production is prohibitive, access to wild

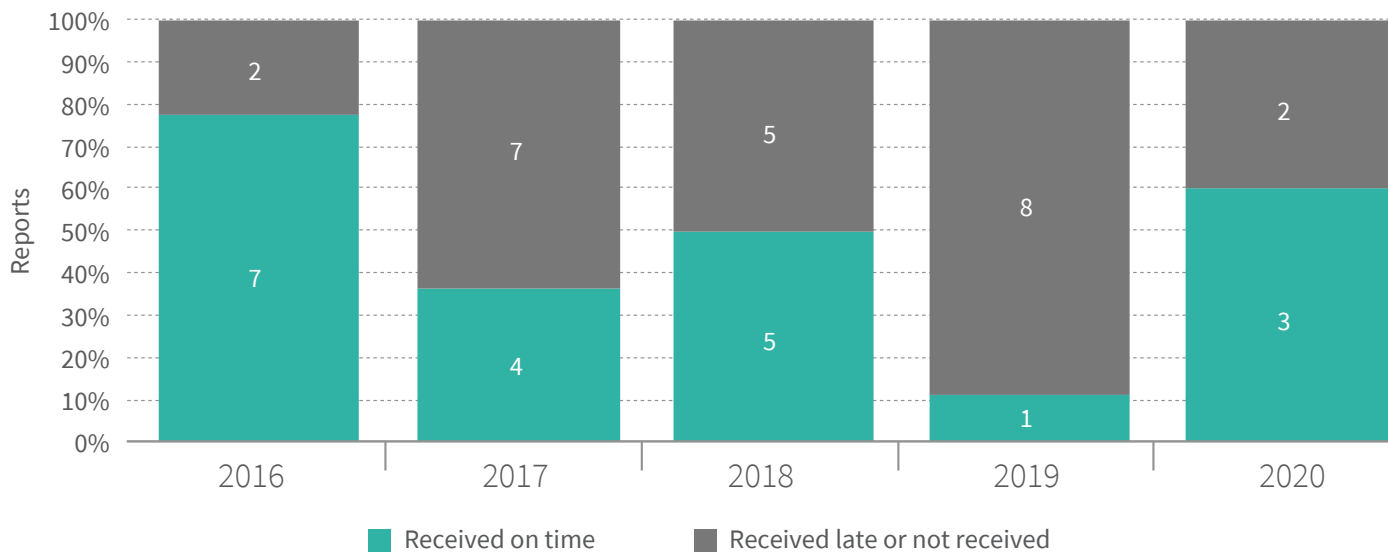
stocks is essential to development and expansion of the aquaculture industry.

Most shellfish access licences are issued for geoduck broodstock or Pacific oyster spat collection. Aquaculture licence holders who are issued ITC or access licences must complete and submit to the Department a record of transfer form no later than 30 days after completion of the transfer activity.

Transfer Licence Reports Submitted to DFO, 2016-2020



Access Licence Reports Submitted to DFO, 2016-2020



Key Issues in Shellfish Aquaculture

COVID-19 PANDEMIC

With the onset of the Covid-19 pandemic in 2020, the shellfish aquaculture industry suffered as restaurants closed and the global demand for shellfish decreased. Shellfish farmers faced many challenges as a result of public health measures enacted to mitigate the spread of COVID-19. The Government of Canada recognized these challenges and the importance of supporting Canada's aquaculture industry and implemented response measures for the aquaculture sector, including financial support for the fish and seafood processing sector and for harvesters impacted by the pandemic.

For more information on COVID-19 measures, updates, and guidance issued by Fisheries and Oceans Canada (DFO) visit: <https://www.dfo-mpo.gc.ca/covid19/index-eng.html>.

SHELLFISH SAFETY, OUTBREAKS, AND TRACEABILITY IN BC

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 environments that are contaminated. The consumption of contaminated bivalves can result in varying levels of illness and even death, depending on the nature of the contamination. DFO and other federal partners, along with the industry, have taken steps to monitor and implement practices to minimize risk associated with contaminated shellfish.

Norovirus Outbreaks

Food-borne illness outbreaks in BC, including both norovirus and *Vibrio parahaemolyticus*, attributed to consumption of raw or undercooked oysters, not only have the potential to cause serious reputational damage to Canadian shellfish product and to limit access to export markets, but also result in significant economic losses.

One of DFO's priorities for 2020 was to minimize the potential for an outbreak of norovirus, a highly contagious virus that can be transmitted through the consumption of contaminated raw oysters. Despite these efforts, there was an outbreak of norovirus in 2020 that was attributed to the consumption of raw oysters from British Columbia. The outbreak resulted in twenty-seven clusters of illness. The Food Illness Outbreak Response Protocol was implemented on February 21, 2020 and was effective in stopping the outbreak. To protect the health and safety of consumers, three shellfish aquaculture facilities were closed from February to June.

AQUACULTURE DEBRIS

Each year, more than eight million metric tons of plastic end up in the world's oceans. Plastic debris can have 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, entanglement, and absorption of chemicals by shellfish destined for human consumption. Marine debris originates from a variety of sources including, but not limited to, the shellfish aquaculture industry. Abandoned, lost, or discarded fishing and aquaculture gear (also known as ghost fishing gear) is a major contributor to plastic marine debris.



Marine debris from the aquaculture industry, including derelict and abandoned gear, unmaintained infrastructure, improperly wrapped or exposed foam, and errant netting, is a significant environmental impact. Licence conditions require licence holders to protect fish and fish habitat by taking measures to remove end of life infrastructure and refuse from the marine environment.

In 2020, DFO continued to receive numerous and ongoing complaints from local residents and environmental groups in areas where shellfish aquaculture activities are concentrated, citing poorly maintained or derelict gear from farms. DFO continued to take actions to advance Canada's commitments under the [G7 Ocean Plastics Charter \(https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/international-commitments/ocean-plastics-charter.html\)](https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/international-commitments/ocean-plastics-charter.html), specifically addressing debris from the fishing and aquaculture sectors.

The newly announced [Ghost Gear Fund](#) will support Canadians in their actions to reduce abandoned, lost or otherwise discarded fishing gear, including aquaculture infrastructure. The program offers

\$8.3 million over 2 years (2020–2022) for the retrieval and responsible disposal of ghost fishing gear, as well as for the acquisition and piloting of currently available innovative gear technology. Applications opened in January 2020 with shellfish growers and their associations were encouraged to apply.

Also in 2020, DFO directly supported the [Ocean Legacy Foundation \(https://oceanlegacy.ca\)](https://oceanlegacy.ca) under the [Innovative Solutions Canada \(ISC\) Plastic Innovation Challenge](#) to increase technology and capacity to recycle end of life ocean plastics, including fishing and aquaculture gear.

For more information visit: Innovative Solutions Canada (ISC) Plastic Innovation Challenge (<https://www.ic.gc.ca/eic/site/101.nsf/eng/00087.html>).

Clean-Up Projects

As a part of DFO's commitment to protecting and cleaning up the marine environment, the Department partnered with several regulatory departments and shellfish associations to undertake clean-up projects in 2020:



Nootka Sound Clean-Up, 2020

Turn it in Week

DFO and the BC Shellfish Growers Association (BCSGA) set up collection depots for end of life shellfish gear across the south coast of BC allowing growers to turn in old and degraded gear for recycling or responsible disposal. Efforts resulted in the removal of 51.7 tonnes of gear from marine environment.

Nootka Sound and Esperanza Inlet Clean-up

DFO partnered with the Aboriginal Aquaculture Association (AAA) to fund the removal of abandoned shellfish aquaculture gear from several locations in Nootka Sound and Esperanza Inlet. Commercial divers, shore crews, and a large barge were utilized to remove over ten tonnes of abandoned plastic and polystyrene (Styrofoam) debris.

Abandoned Oyster Farm Removal, Clayoquot Sound

DFO, BC Forest, Lands, Natural Resource Operations (FLNRORD), and Transport Canada (TC) collaborated to hire commercial dive and barge contractors to remove an abandoned oyster farm in Clayoquot Sound. Approximately 40 tonnes of degraded gear and infrastructure were removed. In addition, with the assistance of the Canadian Coast Guard and Transport Canada, derelict vessels and associated hydrocarbons were also removed.

Abandoned Oyster Spat Collection Gear, Pendrell Sound Rockfish Conservation Area

DFO contracted a commercial dive company to conduct a survey of the Pendrell Sound Rockfish Conservation Area (RCA). The survey identified abandoned oyster spat collection gear consisting of ropes, netting, and various types of manufactured plastic items across Pendrell Sound. The debris was found to be negatively impacting fish and fish habitat, and posing an entanglement risk to marine mammals. Enforcement follow up will be conducted where ownership of the gear can be established, and a ghost gear removal and habitat remediation plan for the Sound is being drafted and will be actioned in 2021.

SUMMER MORTALITIES

Pacific oysters have been cultivated in BC for over a century and account for the majority of shellfish cultured in the province. Over the last decade, cultured Pacific oysters throughout the province have been subject to periodic mass mortalities, ranging from at least 30% to near total loss, during the summer months. Field research by DFO Science has confirmed that oyster summer mortalities in BC, like other regions, are correlated with high seawater temperatures, increased reproductive effort, and the presence of a pathogenic bacterium (*Vibrio aestuarianus*). This work was published in 2020 as part of a University of Victoria Master's thesis: <https://dspace.library.uvic.ca/handle/1828/12114>.

AQUATIC INVASIVE SPECIES

The shellfish aquaculture industry has the potential to propagate the spread of Aquatic Invasive Species (AIS) by increasing available habitat and intentionally or unintentionally spreading AIS to new locations through aquaculture-related movements. This is a concern as 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 AIS species are present in BC including:

- the violet tunicate (*Botrylloides violaceus*)
- golden star tunicate (*Botryllus schlosseri*)
- club tunicate (*Styela clava*)
- carpet sea squirt (*Didemnum vexillum*); and
- European green crab (*Carcinus maenas*)

However, there are other AIS of concern and the potential for new AIS to be detected.

In 2020, DFO Science completed a multi-year study on the effectiveness of pressure washing to remove AIS from cultured Pacific oysters. Results confirmed that various pressure-washing treatment resulted in significant reduction in biofouling. However, oysters treated with pressure washing had reduced shell condition and AIS always remained on the oysters, suggesting that treatments are not 100% effective. Results from this study will help inform DFO's Aquaculture Management Division (AMD) about the efficacy of AIS mitigation measures and potential next steps.

A full copy of the publication can be found here: https://www.reabic.net/journals/mbi/2021/3/MBI_2021_Curtis_etal.pdf.

CLIMATE CHANGE AND CHANGING OCEAN CONDITIONS

The economic sustainability of aquaculture operations is contingent on minimizing risks from the changing climate including those posed to infrastructure and biological outcomes. Evaluating these risks is complex and some culture methods may be more impacted than others. Aquaculture infrastructure may be damaged by increased storm frequency and intensity, and rising water temperatures may affect the growth of cultured shellfish resulting in reduced resistance to diseases.

Shellfish aquaculture facilities in BC have experienced the effects of ocean acidification, which occurs when the availability of minerals (aragonite and calcium carbonate) is reduced. This results in poor shell formations, poor health, reduced growth,

and ultimately a lower quality product. DFO and industry are collaborating through the Aquaculture Collaborative Research and Development Program on a number of research projects related to understanding the current and future effects of ocean acidification on shellfish aquaculture. In 2021, DFO will begin to examine the effects of increased ocean temperatures and ocean acidification on juvenile shellfish.

More information on climate change and changing oceans can be found at: <https://www.pac.dfo-mpo.gc.ca/science/index-eng.html>.

Education, Outreach, and Engagement

Fisheries and Oceans Canada (DFO) consults with First Nations, stakeholders, and Canadians on matters of interest and concern related to aquaculture in BC. Consultation and engagement play important roles in good governance, sound policy development, and decision making. Our goal is to promote 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 more informed public and resource users, and improving the licence holder's ability to comply with regulatory requirements.

FISHERY NOTICES

Fishery notices are a fast and efficient method of broad communication of important information related to all fisheries in BC. Users can sign up to receive text-based notices pertaining to specific fisheries or areas.

A list of all fishery notices, including those related to shellfish harvest sanitary closure can be found at: <https://notices.dfo-mpo.gc.ca/fns-sap/index-eng.cfm>.

ADVISORY PANELS AND WORKSHOPS

DFO shellfish aquaculture managers participate in a number of advisory panels and working groups intended to facilitate industry outreach, education, and collaboration. However, due to the COVID-19 pandemic many in-person activities, including the [BC Seafood Expo](#), were cancelled in 2020. Some meetings were adapted to an online format, with intention of returning to in-person meeting in future years.

- The [Shellfish Aquaculture Management Advisory Committee \(SF-AMAC\)](#) is a multi-stakeholder forum 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 at: <https://www.pac.dfo-mpo.gc.ca/consultation/aquaculture/index-eng.html>.
- The [Shellfish Aquaculture Industry Advisory Panel \(SAIAP\)](#) is a platform for a formal consultation process between DFO and industry and is mainly comprised of BC Shellfish Growers Association (BCSGA) board members. The SAIAP ensures regular communication on major policy, research, and regulatory issues, as well as updates from industry on their priorities and business realities. SAIAP was not active in 2020 but moving forward, DFO hopes to re-engage industry through SAIAP.
- A diverse group of stakeholders from across western Canada, as members of [The Canadian Council of Ministers of the Environment \(CCME\)](#), met in Vancouver in January 2020

for phase two of a workshop dedicated to development of a national action plan to address plastic waste, including fishing and aquaculture sourced plastic.

For more information on the CCME and their current activities, visit: Canadian Council of Ministers of the Environment (CCME) Action Plan to Achieve Zero Plastic Waste (<https://ccme.ca/en/current-activities/waste>).

- In February 2020, DFO hosted the [National Ghost Gear Summit](#) in Halifax, Nova Scotia. This summit, developed out of the G7 Ocean Plastics Charter, brought together multiple stakeholders to discuss solutions and best practices for mitigating and preventing lost, abandoned, discarded fishing and aquaculture gear.

For more information on the G7 Ocean Plastics Charter and its partners visit: Ocean Plastics Charter - Canada.ca (<https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/international-commitments/ocean-plastics-charter.html>).

Summary of Key Topics for Education, Outreach, and Engagement, 2020

KEY TOPIC	DELIVERY MECHANISM
National Aquaculture Act	<ul style="list-style-type: none"> • SF-AMAC (October 28, 2020) • Fishery Notices: <ul style="list-style-type: none"> • Aquaculture Act Engagement (August 19, 2020) • Letter to First Nations: <ul style="list-style-type: none"> • Aquaculture General Engagement Letter (September 3, 2020)
Shellfish Conditions of Licence Renewal	<ul style="list-style-type: none"> • SF-AMAC (October 28, 2020) • Letters to Industry and First Nations: <ul style="list-style-type: none"> • Aquaculture General Engagement Letter (September 3, 2020) • Letter to all coastal Nations outlining proposed Conditions of Licence (October 29, 2020) • Meetings with BC Shellfish Growers Association (September 6, October 6, 9 and November 4, 2020) • PRISC (October 21-22, 2020) • FNFC-ACC (October 29 and November 16, 2020) • Shellfish Licence Holder Zoom calls with Vietnamese, Cantonese and Mandarin interpreters (November 25, 26 and 27, 2020) • Fishery Notice <ul style="list-style-type: none"> • Shellfish Licensing Information requiring fees be paid prior to the April 1 reissuance. (October 26, 2020) • DFO Workshop On Shellfish Aquaculture Conditions of Licence (November 13, 2020)
Bivalve Traceability – including traceability conditions of licence, tagging, Annual Aquaculture Statistical Reports (AASR), audits of record keeping requirements and Bivalve Traceability Action Plan	<ul style="list-style-type: none"> • SF-AMAC (October 28, 2020) • Fishery Notices: <ul style="list-style-type: none"> • Amendment to licensing procedures for multi-party licence holders. (August 14, 2020) • Shellfish Aquaculture Traceability Infographic (August 21, 2020)
Canadian Shellfish Sanitation Program Updates	<ul style="list-style-type: none"> • SF-AMAC (October 28, 2020) • Fishery Notices: <ul style="list-style-type: none"> • Risk of Paralytic Shellfish Poisoning (July 3, 2020) • Risk of Vibrio (May 15, 2020) • MCFR licence renewal reminder (November 30, 2020)
Integrated Environmental Compliance – including Debris Action Plan)	<ul style="list-style-type: none"> • Fishery Notices: <ul style="list-style-type: none"> • Marine debris: Prevent the loss of aquaculture gear to the environment (November 27, 2020) • Shellfish-Turn it in Week: An Opportunity to Dispose of Old Degraded Shellfish Aquaculture Gear for Free (February 24, 2020)
Marine Mammal Deterrents	<ul style="list-style-type: none"> • Fishery Notice: <ul style="list-style-type: none"> • Shellfish-Sea Lions and Marine Debris Mitigation measures to prevent the loss of aquaculture gear (February 10, 2020)
Access to Wild Resources – Collection of Wild Oyster Spat	<ul style="list-style-type: none"> • Letters to Industry: <ul style="list-style-type: none"> • Letter outlining suspended access to wild oyster spat (August 21, 2020)
Area Based Management	<ul style="list-style-type: none"> • Letter to First Nations: <ul style="list-style-type: none"> • Aquaculture General Engagement Letter (September 3, 2020)
DFO Aquaculture Management Priorities	<ul style="list-style-type: none"> • Letter to First Nations: <ul style="list-style-type: none"> • Aquaculture General Engagement Letter (September 3, 2020)

Looking Forward

Fisheries and Oceans Canada (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.

CONDITIONS OF LICENCE REISSUANCE

In 2020, DFO started to engage on the reissuance of the shellfish aquaculture conditions of licence with a goal of addressing conservation concerns related to the traceability of harvested bivalve shellfish and the protection of fish and fish habitat. While shellfish aquaculture licences and associated conditions were set to expire on April 30, 2025, DFO has the authority to change conditions of licence prior to expiry where conservation and protection of wild fish is deemed to be an identifiable concern.

In the fall of 2020, engagement letters were sent out on the draft conditions of licence. Additionally, virtual meetings and consultation with industry, First Nations, and stakeholders were initiated. Interpretive services were available in Cantonese, Mandarin, and Vietnamese for the virtual meetings. Input on the draft conditions of licence were taken into consideration to be finalized for licence issuance in 2021.

TICKETING

When an aquaculture licence holder violates a condition of licence, they can only be charged in a court of law. Fishery Officers, Fishery Guardians, and DFO aquaculture regulators work closely with licence holders using the four pillars of enforcement to encourage compliance with conditions of licence. This approach includes education, warnings, charges, and restorative justice. There is ongoing interest in expanding the list of ticketable fisheries offences under the federal *Contraventions Act* to give aquaculture regulators another tool for enforcing compliance. This would allow tickets to be issued for minor offences where warnings are inappropriate (in cases of repeated or severe violations) and charges might be considered too drastic. The changes were accepted in late 2020 and it is expected that ticketing for minor commercial fishery and aquaculture violations will become a reality in 2021.

For more information on the fisheries violations and *Contraventions Act* visit: <https://www.dfo-mpo.gc.ca/fisheries-peches/consultation/ticketing-contraventions/bkgrd-docinfo-eng.html>.

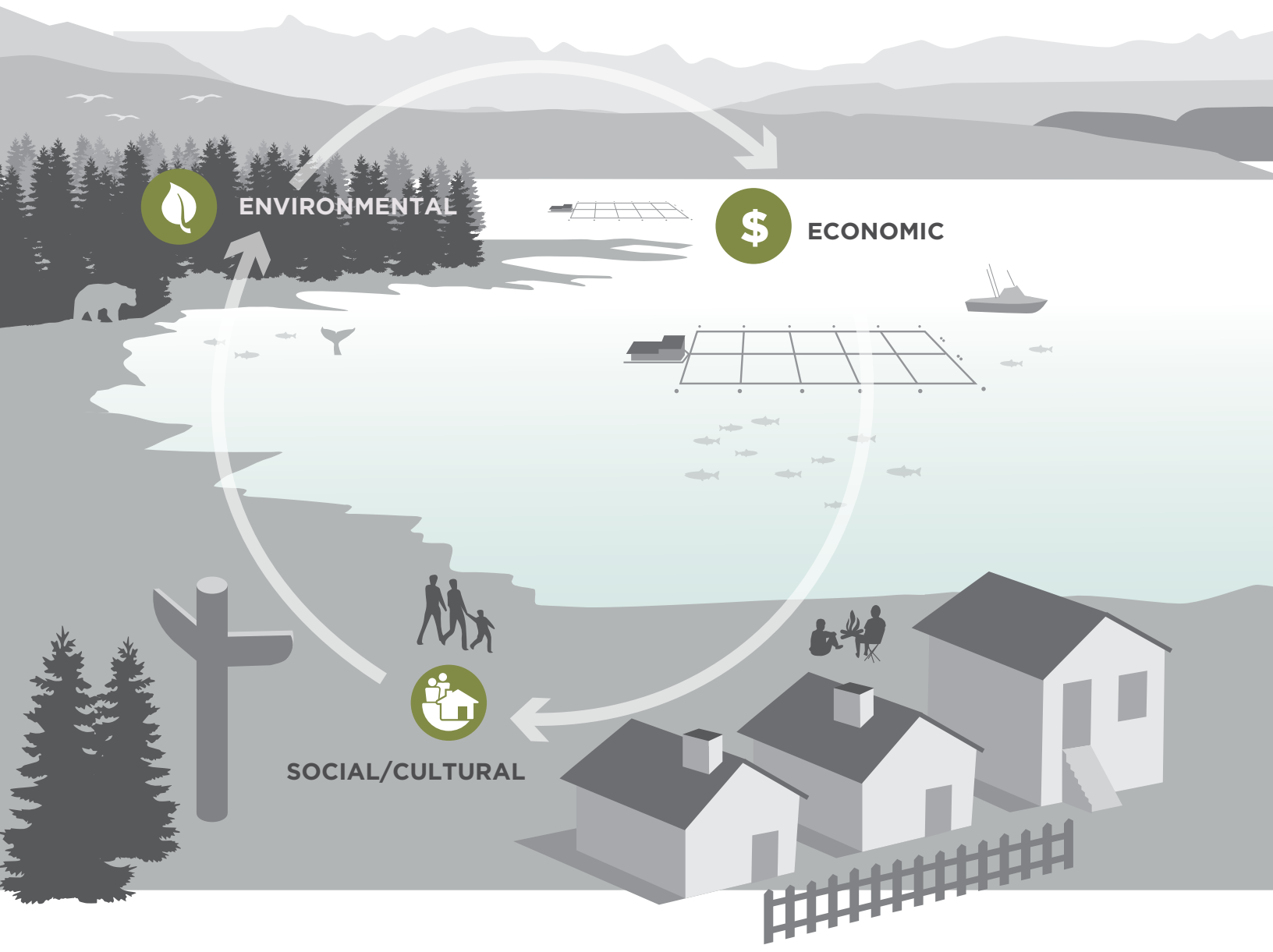
AREA-BASED AQUACULTURE MANAGEMENT

DFO is committed to exploring an area-based approach to aquaculture that considers managing facilities at the best geographic scale. In 2020, \$3 million over two years was committed to pilot this approach. It is anticipated that an area-based approach will enable the aquaculture sector to develop in environmentally and socially suitable areas where First Nations and local communities are supportive of the industry. Initial work on this project will be focused on:

- starting conversations with the province of BC, First Nations rights & title holders, and Indigenous organizations to seek partnerships in regional and area-based governing bodies;

- discussing principles of area-based aquaculture management with governments and stakeholders to seek interest and support;
- creating criteria for a “pilot” area; and
- seeking partners within that area to create a governance structure and stakeholder engagement process and consider aquaculture management in a way that respects the unique social, cultural, environmental, and economic values in that area.

The expected result of this approach is improved social licence, increased Indigenous participation in aquaculture management, increase investor certainty, and improve environmental management while enhancing food security and sustainability.



AQUACULTURE GRANTS AND CONTRIBUTIONS

While not exclusively for the aquaculture sector, DFO finances initiatives to support, promote, and improve sustainability of the industry under national and regional grants and contributions programs. Shellfish aquaculture initiatives can qualify for these programs, which may include collaborative studies, research projects, support for development of innovations, community outreach and capacity building, and promotion of the departmental mandate.

Fisheries and Aquaculture Clean Technology Adoption Program

Fisheries and Aquaculture Clean Technology Adoption Program (FACTAP) is a national contribution program investing \$20 million over four years (2017 to 2021) to assist Canada's fisheries, aquaculture and seafood processing industries in improving their environmental performance. The program offers funding to eligible participants to implement market-ready clean technologies, processes and sustainable practices into their day-to-day operations.

In 2020, over \$1.1 million was allocated towards projects benefitting the shellfish aquaculture industry, however some projects were not completed due to challenges caused by the COVID-19 pandemic.

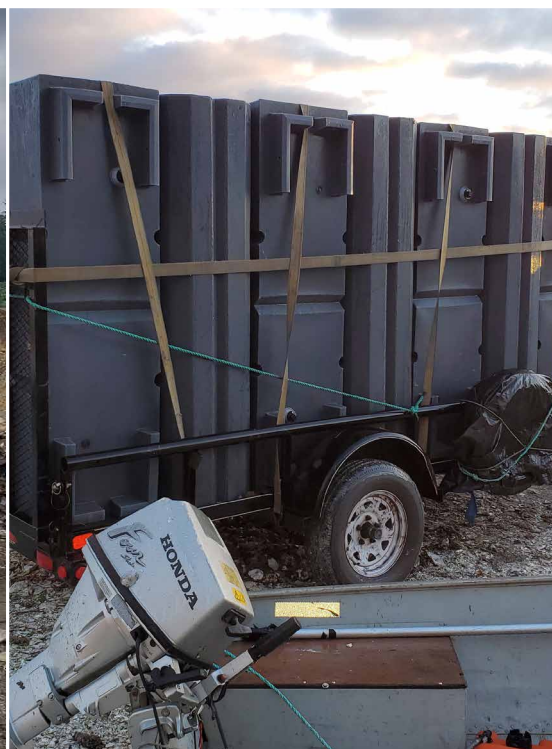
A list of projects funded by the FACTAP can be found at: <https://www.dfo-mpo.gc.ca/aquaculture/business-entreprises/factap-patppa-funding-financement-eng.htm>.

Pacific Integrated Commercial Fisheries Initiative

The Pacific Integrated Commercial Fisheries Initiative (PICFI) provides monetary support to Indigenous groups and communities in BC to maximize the potential of their communal commercial fishing enterprises and strengthen community economic self-sufficiency within the framework of an orderly, stable, and integrated commercial fishery.

The objective of the program is to develop self-sustaining Commercial Fishing Enterprises (CFEs), whereby eligible Indigenous groups are fully capable of taking complete ownership of fisheries operations and becoming successful, self-sustaining harvesters.

(left) Disposal of degrading exposed polystyrene billets from a shellfish aquaculture facility; (center) New air-filled HDPE flotation to be installed at a shellfish aquaculture facility; (right) An algae photobioreactor in operation at a shellfish hatchery.



In 2020, 19 of 63 applications received were aquaculture related, the majority of which were from the shellfish industry. Nine of these applications were successfully funded for a total of approximately \$1.84 million.

For more information on the PICFI program visit:

<https://www.dfo-mpo.gc.ca/fisheries-peches/aboriginal-autochtones/picfi-ipcip-eng.html>.

British Columbia Salmon Restoration and Innovation Fund

The British Columbia Salmon Restoration and Innovation Fund (BCSRIF) is intended to ensure that the fish and seafood sector in BC is positioned for long-term environmental and economic sustainability. This joint federal/provincial fund supports the protection and restoration of wild Pacific salmon and other BC fish stocks. Funding is available to support project activities until March 31, 2024.

For 2020 application review, there was a focus on supporting projects relating to aquaculture and the changing environment. Priority was given to new aquaculture technologies and processes that would improve environmental performance and increase supply chain transparency. For example, strategies to reduce chemical usage or support beach-to-plate traceability of shellfish products. Contribution agreements are being developed for projects selected through the 2020 application opportunity, and details of funding will be announced once agreements have been finalized.

More information on BCSRIF program visit: British Columbia Salmon Restoration and Innovation Fund (<https://www.dfo-mpo.gc.ca/fisheries-peches/initiatives/fish-fund-bc-fonds-peche-cb/index-eng.html>).