



Wild Fish Trapped

**Incidental Catch in the
Salmon Farming Industry**

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Wild Fish Trapped:

Incidental Catch in the Salmon Farming Industry

Background

In recent years, Fisheries and Oceans Canada (DFO) has been criticized by numerous high profile and independent entities on its failure to protect British Columbia's wild fish from the risks of open-net salmon farms:

2012 - the \$37 million *Cohen Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River* concluded DFO's alignment with the salmon farming industry may impede its ability to protect wild fish;¹

2012 - an expert panel appointed by the Royal Society of Canada concluded DFO's alignment with industry may impede its conservation of biodiversity mandate;²

2018 - the Auditor General of Canada concluded DFO did not adequately enforce compliance with salmon farming regulations to protect wild fish;³

2018 - an expert independent panel appointed by Canada's Chief Science Advisor, Dr. Mona Nemer, found problems with DFO aquaculture science, including transparency issues with online reporting and risk assessments;⁴ and

2019 - a federal court judge concluded that, in relation to the risks of fish farm pathogens, DFO "fails to embody and is inconsistent with the precautionary principle, and it fails to take into consideration the health of wild Pacific salmon."⁵

In short, DFO's record on regulating the salmon farming industry is fraught with criticism. This includes their communication of science, and public reporting. They require continued auditing and critique. This report aims to increase public understanding of the risks of open-net salmon farming and the inadequacies of DFO's oversight of this industry.



Wild and farm fish in Okisollo salmon farm, April 2018.

photo: George Quocksister Jr.

What is incidental catch in salmon farms?

At any one time, there are approximately 60 to 70 active salmon farms in British Columbia.⁶ Salmon farms use nets suspended in coastal ocean areas. The nets at one farm can contain upwards of 1 million Atlantic salmon—a non-native species. Open-net pens allow waste, feces, pesticides and chemicals to pass from the farm into coastal waters. The open-nets also allow small wild fish to pass freely into the farms. It is known that wild fish can swim into salmon farm nets and grow along with farm salmon until they are too large to swim out of the nets.⁷

DFO defines incidental catch on salmon farms as: “any wild fish from within the facility caught during harvest, movement of fish between or within facilities, or net removal.”

This definition implies wild fish are only considered incidental catch at very specific times during salmon farming operations: during harvest, during fish transfer or when fish farm nets are removed. This definition also implies DFO may be turning a blind eye to wild fish confined in salmon farms during everyday operations throughout the year.

Conditions attached to federal salmon farm licences state: “the licence holder must ensure that any live incidental catch are immediately returned to waters outside the aquaculture facility in a manner that causes it the least harm.”

Given DFO’s definition of incidental catch, the industry may only be required to return wild fish trapped in farms when it is convenient for them to do so: during harvest, transfer or net removal. It is unclear how many wild fish are trapped in everyday B.C. salmon farming operations because no data on live releases are publicly reported by DFO and no farm surveys of wild fish (dead and alive) are reported.



Sick farm fish and clogged nets at Brent Island salmon farm, April 2018.

photo: George Quocksister Jr.

Wild fish may be trapped in salmon farms all year round

Evidence that suggests wild fish may be trapped in salmon farms on a large scale surfaced in 2017 and 2018, when First Nations visited salmon farms on the east side of Vancouver Island. They collected video evidence showing numerous wild fish caught in multiple salmon farms.⁸

Despite some sophisticated monitoring equipment (on at least some farms) and the requirement to regularly report incidental catch to DFO, it took First Nations' inspections to uncover the widespread extent of wild fish caught in open-net salmon farms.

Although DFO apparently conducts audits of harvest and transfer activities,⁹ an examination of DFO's public reporting of industry data yielded no information on whether DFO actually audits incidental catch monitoring by the industry in any comprehensive or systematic manner.

DFO did report that industry submitted 54 incidental catch reports in 2016 and 41 in 2017.¹⁰ As a condition of their licences, salmon farming operators are required to submit these reports by deadlines; however, as with many salmon farming conditions of licence, penalties (e.g. fines, loss of licences) are rarely issued. Over 2016 and 2017, 38% (36) of the reports submitted by industry were either late or incomplete.¹¹

These issues are troubling and raise several important questions, including:

1. How well is the salmon farming industry doing at "immediately" returning live incidental catch to waters outside their facilities? No public reporting or data are available on this.
2. How well is DFO monitoring incidental catch in the salmon farming industry? How frequently do they actually monitor or audit incidental catch (if at all) by salmon farms to verify industry-reported data?

DFO's incidental catch reporting lacks transparency

According to DFO licence conditions (see Appendix 1), industry is required to record the stage at which they witness incidental catch and report this information to DFO. The stage categories they have to choose from are: harvest, transfer, net observation or carcass.

Despite the existence of these categories, DFO does not publicly report the stage information on their website, making it difficult to tell how these wild fish were caught and during what stage of farming. As mentioned, the number of wild fish released outside salmon farms is also not reported. It is also unclear how DFO specifically audits the industry self-reporting of incidental wild catch. These gaps in government oversight of the salmon farming industry impede in-depth analyses that could help the public better understand incidental catch in salmon farms.



Wild and farm fish in Brent Island salmon farm, April 2018.

photo: George Quocksister Jr.

How are wild fish caught in fish farms negatively impacted?

Although salmon farms have operated in British Columbia for decades, incidental catch data have only been reported publicly in the last several years. Given the limited amount of information publicly available, and the shortcomings of the data identified above, the true extent of impacts of salmon farms on wild fish entering their pens is largely unknown. Wild fish entering salmon farms may be negatively impacted by the industry in several ways, including being:

- eaten by farm salmon;
- caught during salmon farm operations and killed;
- injured or stressed during capture by the industry and released outside the farm;
- infected with pathogens and/or parasites from farm fish; and
- contaminated with pesticides, medications and other toxins through eating fish farm feed.

In 2017, DFO began a study to investigate wild fish predation by B.C. farmed salmon.¹² They found a total of seven wild fish in the stomachs of 7,200 farmed fish, a prevalence of 0.1%. Given 85,000 tonnes of B.C. farmed salmon were produced in 2017,¹³ and assuming the average size at harvest of each farm fish is 5 kg, we estimate that approximately 17,000 wild fish may have been eaten by farm salmon in 2017.

However, there are a couple concerns with DFO's research. It is difficult to examine the veracity of this estimate of annual predation for two reasons. This predation research has been conducted in partnership with the four largest salmon farming companies in B.C. presenting at least the perception of a potential conflict of interest. Also, limited details are provided about the study. For example, although DFO report farmed fish were selected randomly for study, it is unclear how they selected the salmon farms in this study or whether the industry knew in advance what farms would be studied.

Anecdotally, at least one aquaculture light company promotes their products by suggesting they may benefit industry through predation:

“Ocean aquaculture fish farmers can benefit by attracting smaller bait fish into their sea pens providing a natural food source and reduce production costs.”¹⁴



Discovery Islands salmon farm.

photo: Stan Proboszcz

Incidental catch—a closer look at available data

DFO’s website reports some data self-reported by the salmon farming industry.¹⁵ The data are in a spreadsheet and are not in the most publicly-accessible form to examine; therefore, we provide a few simple graphs.

Figure 1. Number of Incidental Wild Fish Reported on B.C. Salmon Farms

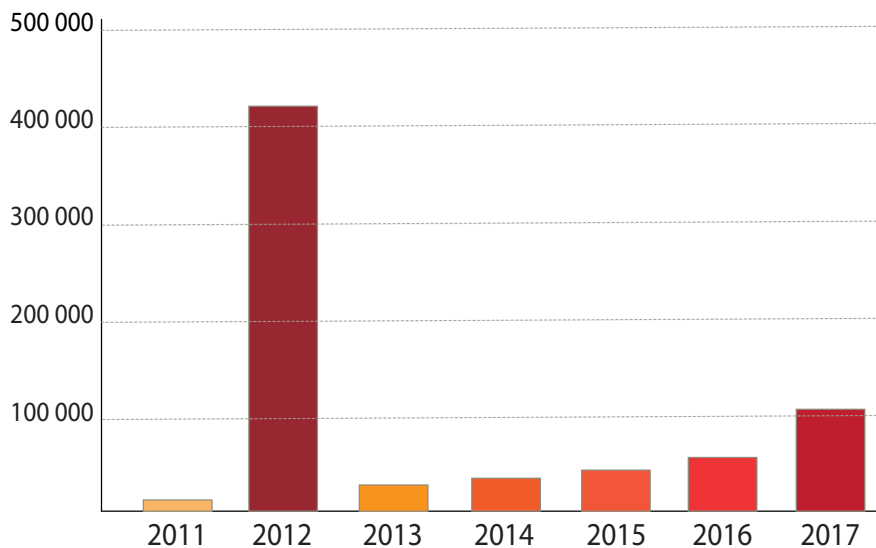


Figure 1. An anomalous spike in 2012 is the result of two large depopulation events ordered by the Canadian Food Inspection Agency (CFIA) because of Infectious Hematopoietic Necrosis Virus (IHNV), according to DFO. The two events resulted in 405,000 herring being killed and is discussed in more detail in the following sections. Barring this 2012 event, we see a growing trend in incidental catch from 2011 to 2017. Due to transparency issues, the cause is not clear.

The conditions of licence state:

“The licence holder must design and use nets and other gear or equipment in a way that reduces the risk of incidental catch, and causes the least amount of harm to incidental catch.”

It is unclear how, or even if, the industry is reducing the risk of incidental catch. It appears preventative measures are left solely up to the industry, which may be a prime factor in the increasing trend of incidental catch.

Large wild fish kills at salmon farms in 2012

In 2012, there were two substantial incidental catch data entries worth noting. These two incidents resulted in 405,000 herring being killed in 2012 (Figure 1).

The first occurred in May, 2012, at Mainstream's Dixon Bay salmon farm on the west coast of Vancouver Island, near Tofino. (Mainstream is now owned by Cermaq, a subsidiary corporation of Mitsubishi.) This farm was initially quarantined by CFIA.¹⁶ Later, the media reported that approximately 500,000, one kilogram farm salmon were destroyed to prevent the spread of IHNV. Despite claims by salmon farming industry spokespeople of high fish health standards and disease preventative measures, it appears Mainstream did not vaccinate their Dixon Bay farm fish for IHNV.¹⁷

What really happened at Dixon Bay salmon farm in 2012?

It is unclear whether CFIA mandated a cull at Dixon Bay in 2012. The Vancouver Sun reported Mainstream did not wait for confirmation from CFIA and would cull their farm.¹⁸ Another 2014 Vancouver Sun story reported \$4.1 million was paid by the federal government to compensate B.C. salmon farms for mandatory disease culls.¹⁹ The article states:

“An earlier outbreak in May of that year (2012), at Cermaq's Dixon Bay farm on the west coast of Vancouver Island, wasn't compensated because the company emptied its site without receiving a Food Inspection Agency destruction order.”

However, DFO's incidental catch data record suggests CFIA did order a cull for Dixon Bay during May of 2012. The DFO record says:

“Incidental catch the result of a depopulation order from CFIA to control the spread of Infectious Haematopoietic Necrosis virus (IHNV) and not unintentional/accidental.”

It remains unclear whether the cull was mandated by CFIA. If this was a government mandated cull of wild fish, then it suggests the federal government believes pathogens from salmon farms are a risk to wild fish.

Wild fish collateral damage at Dixon Bay and Millar Channel salmon farms in 2012

One thing not reported in the media about the Dixon Bay IHNV disease outbreak was that over 358,000 herring were also killed, according to DFO data. Did Mainstream act on their own to kill their fish and 358,000 herring, before a mandated cull order from CFIA?

Despite this incident, which may have been averted if the company vaccinated their fish, it does provide us with an estimate of the number of wild fish trapped in a B.C. salmon farm at any one time.

In August 2012, Millar Channel, another farm owned by Mainstream Canada (now owned by Cermaq), reported over 47,000 wild fish killed. According to DFO, this was also the result of a depopulation order from CFIA, due to an outbreak of IHNV.

How many wild fish are trapped in B.C. salmon farms?

Despite the lack of transparency around the number of wild fish trapped in everyday salmon farming operations, we estimate this number using the incidental catch records for the two depopulation events reported in 2012 at Dixon Bay and Millar Channel salmon farms. We assume that the average number of wild fish inside the salmon farms at the times of these depopulation events represents an estimate of the number of wild fish within a salmon farm at any one time. This estimate also assumes the CFIA mandated depopulation killed all the wild fish in each farm. The average number of wild fish killed during these two depopulation events is 203,000 (standard error 155,500).

Using this estimate, and given there are approximately 65 salmon farms operating at any one time in B.C., this means approximately 13.2 million (+/- 10.1 million) wild fish may be held within B.C. salmon farms at any one time.

A Norwegian study used experimental open-net pens ranging in size (5 x 5 x 7 m deep to 12 x 12 x 15 m deep) that contained Atlantic salmon concluded that they can attract and effectively trap wild fish.²⁰

What species of wild fish are killed in salmon farms and where are they caught?

Figure 2. 2017 Incidental Catch Percentage by Species Reported on B.C. Salmon Farms

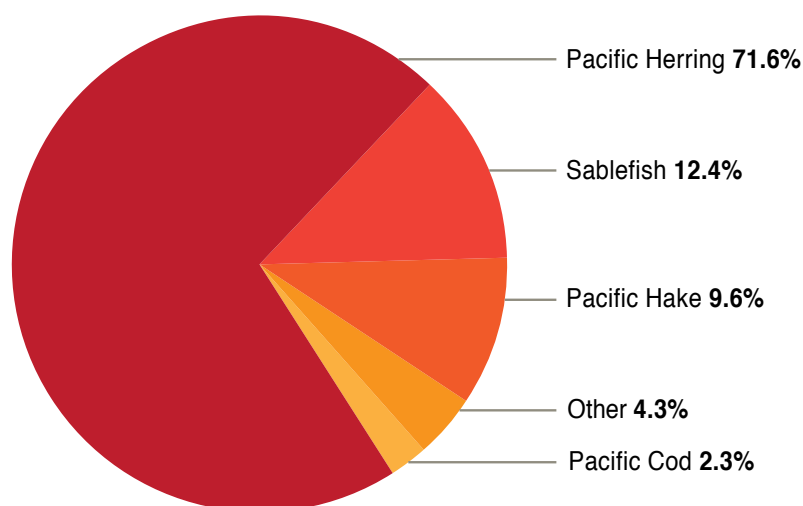


Figure 2. Herring were the most frequently caught species in salmon farms in 2017, followed by sablefish, Pacific hake and Pacific cod. According to industry self-reported data found on the DFO website, over 40 species of fish were caught as incidental catch between 2011-18, including all five species of wild salmon.

Figure 3. 2017 Incidental Wild Fish Catch Reported on B.C. Salmon Farms

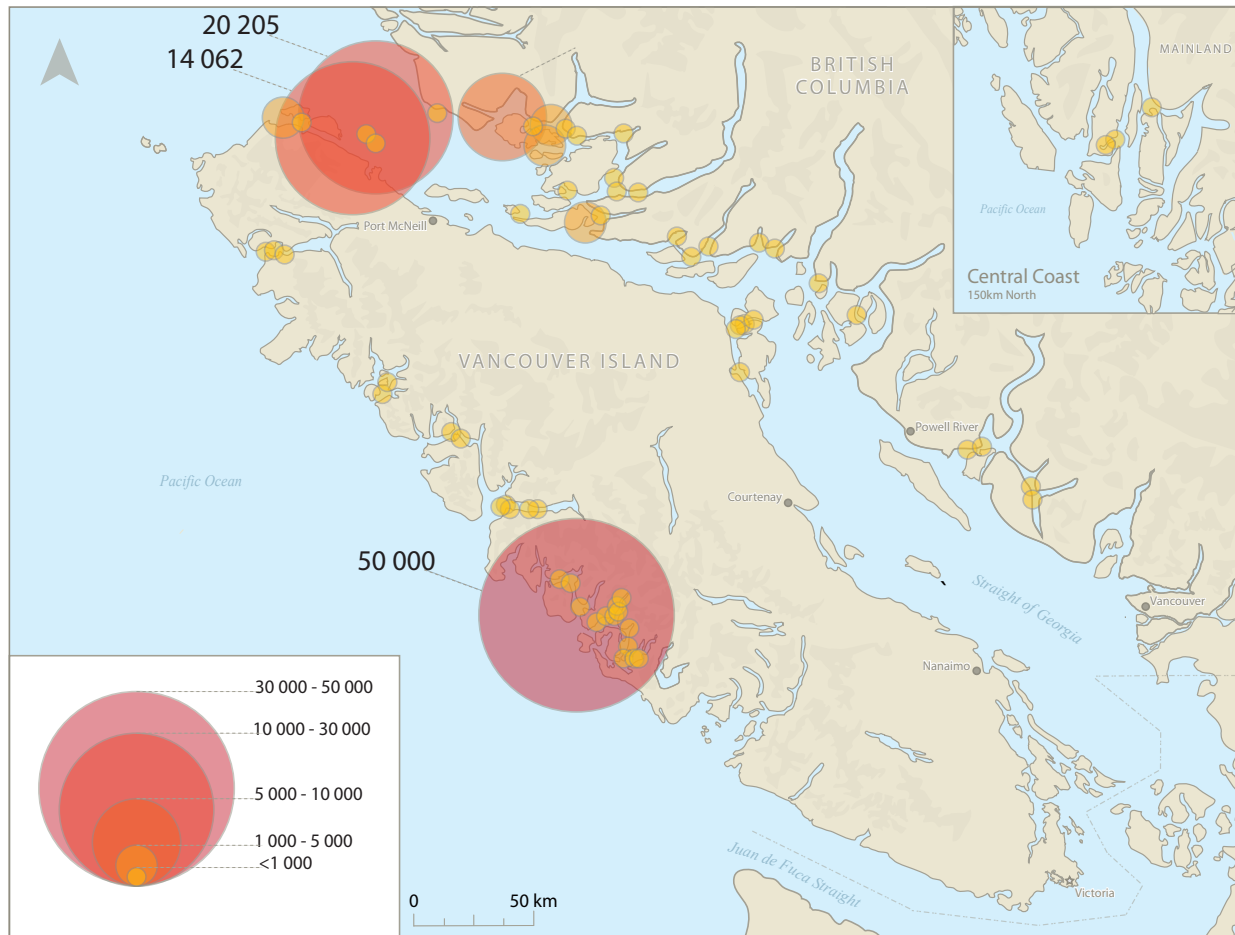


Figure 3. Incidental catch occurs in all areas where the salmon farming industry operates, including the west coast of Vancouver Island, Discovery Islands near Campbell River, Broughton Archipelago, north end of Vancouver Island and the central coast. All of British Columbia's coastal waters are home to resident and migrating wild fish, so it is not surprising incidental catch is geographically widespread throughout the salmon farming industry. (Map designed by Ellika Cairns.)

Wild fish attraction to salmon farms

Research suggests a number of reasons why wild fish are attracted to salmon farms. One reason is that wild fish are attracted to farm lights. Open-net farms in B.C. commonly use underwater lights from autumn to spring to increase the growth rates of their farm fish. For each farm that uses growth lights, they must report to DFO on the number, intensity and type of lights used, in addition to the times of day they are used. Although this information is reported by DFO, a useful analysis could compare whether lights are positively associated with incidental catch at salmon farms. Research from B.C. reported that several fish and invertebrate species including Pacific herring, sand lance and three-spine

stickleback were significantly more abundant around a lit underwater light compared to evenings when the light was not on.²¹

Fish farm feed is another significant factor that can attract large numbers of wild fish.²² In Norway, fishers and fish buyers have claimed the quality of gadoid fish (e.g. cod and hake) that have been eating waste fish farm feed is inferior to wild fish that had a normal diet.²³

Another factor that attracts wild fish to salmon farms is shelter.²⁴

All wild fish attracted to farms do not necessarily end up inside the open-net pens. Many assemble around the farm structures. A Norwegian study estimated the total farm-aggregated wild fish biomass averaged 10.2 metric tonnes per farm (range: 600 kg to 41.6 tonnes) and 12,200 tonnes aggregated across the 1198 active farms in Norway.²⁵ Using this estimate and assuming there are 65 active B.C. salmon farms, they attract approximately 663 tonnes of wild fish to their vicinity at any one time.

Recommendations

1. Increase the transparency of incidental catch data from salmon farms including information on the cause of death (i.e. due to transfer, harvest, depopulation order, other), live releases (i.e., species, number, condition), methodology of DFO audits of incidental catch and regular reporting of wild fish alive in the pens at any one time.
2. Improve preventive and precautionary measures to reduce numbers of wild fish entering salmon farms. Right now, preventative measures under conditions of licence are vague and appear to be solely left to industry. Industry must improve their technology to show decreased incidental catch through independent monitoring or be penalized through substantial fines and/or loss of licences.
3. Wild fish aggregations around and inside salmon farms (inside the nets and in the vicinity of the farm) should be studied more thoroughly to examine pathogen, parasite and chemical transfer to wild fish. The health impacts that salmon farms impart on wild fish aggregations should be examined.

Appendix 1. Conditions of Licence Related to Incidental Catch

9. Incidental Catch

- 9.1 The licence holder must design and use nets and other gear or equipment in a way that reduces the risk of incidental catch, and causes the least amount of harm to incidental catch.
- 9.2 Unless otherwise directed by the Canadian Food inspection Agency or the Department, the licence holder must ensure that any live incidental catch are immediately returned to waters outside the aquaculture facility in a manner that causes it the least harm.
- 9.3 The licence holder must retain all dead incidental catch and dispose of them in the same manner that cultivated stock are disposed of, as set out in section 4.4.
- 9.4 The licence holder must maintain incidental catch records as set out in Appendix VII and must submit to the Department in the following manner:
 - a) for facilities that have fish continuously on site, a report must be submitted on January 15, 2017 and annually every January 15th thereafter for the duration of the licence. Records from the previous calendar year must be included; or
 - b) for all other facilities, a report must be submitted within 15 calendar days of the final date of harvest that includes all records generated during the production cycle. The licence holder must submit a follow-up report if more incidental catch and/or herring spawn is discovered after all containment nets are removed.

Complete Conditions of Licence found here:

<https://www.pac.dfo-mpo.gc.ca/aquaculture/licence-permis/docs/licence-cond-permis-mar/licence-cond-permis-mar-eng.pdf>

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