Annual Compliance Report - 2018

on the

Code of Containment

for the Culture of Salmonids in
Newfoundland and Labrador

Department of Fisheries and Land Resources
Aquaculture Development Branch

Table of Contents

EXECUTIVE SUMMARY:

The Newfoundland and Labrador salmonid aquaculture industry continues to experience growth with two new multinational salmon aquaculture companies coming to the province. Production has decreased from 18,822 MT in 2017 to 15,107 MT in 2018. The Department of Fisheries and Land Resources (FLR) manages the growth of the industry through policies and management plans designed to ensure the sustainability of the industry and environment. These management tools help to ensure that best aquaculture practices are being adhered to. The Code of Containment is an integral part of the approach to successfully manage the growth of the industry and is set as a condition on licenses.

Compliance with the Code in Newfoundland and Labrador is monitored annually and continues to be high. However, in an effort to continually seek improvements and efficiencies, the Code underwent major revisions in late in 2012. The revisions were endorsed through the Aquaculture Liaison committee, made-up of industry, government, and public stakeholders. These new changes were implemented in the 2013 inspection year. Additional changes were made in 2014 and implemented during the 2014 inspection year.

The Code of Containment inspection/reporting program was conducted by FLR throughout 2018. Inspections occurred on 9 active aquaculture sites between January and December. The prevalence of Infectious Salmonid Anemia virus (ISAv) throughout many of the Bay Management Areas (BMAs) and the federally and provincially enforced quarantine areas prevented staff from inspecting many of the active sites. Reporting and inspection results are summarized below:

Nets and Net Testing:
335 nets were recorded in grower's net inventories in 2018. FLR staff recorded 69 nets on sites in the spring and 26 nets on sites in the fall.* There was full compliance with net inventories and audits.

Cage Types: No new cage types were deployed this year.

Mesh Sizes: Appropriate mesh sizes were in use as per industry standard practice and in accordance with mesh size reports commissioned in 2000/01.

Moorings: A "Mooring Maintenance/Replacement Plan" was recommended to address moorings under the Code and was approved by the Aquaculture Liaison committee for inclusion into the latest revision of the Code. These are to be resubmitted annually. All growers have submitted.

Inventory Monitoring and Reconciliation: Industry was fully compliant with this section of the Code. Industry wide, the inventory reconciliation covered a starting number of 9,733,932 salmonids and ended with 8,422,965 salmonids.

Ice Protection: There were no new overwintering sites utilized in 2018.

System Inspections: FLR performed 8 site inspections in spring and 1 in the fall. 10 issues were recorded.

Predator Control Plans: Predator control has been addressed on a site-by-site basis through the cage culture application. The application requires applicants to describe what predators they expect to deal with and how they will deal with them.

Handling Practices: All growers were in compliance with all handling practices as outlined in the Code.

Measures for The Recapture of Escaped Fish: Fisheries and Oceans Canada (DFO) is responsible for this section of the Code. Recapture efforts and technology require review and updating and will be discussed at the next meeting of the Aquaculture liaison committee.

* Infectious Salmonid Anemia virus (ISAv) presence in certain BMA's mandated a federally and provincially enforced quarantine area around these sites. This prevented staff from inspecting the majority of the active sites.

1.0 INTRODUCTION:

The Code of Containment for the Culture of Salmonids in Newfoundland and Labrador (herein referred to as "The Code") has been in effect since 1999. This Annual Compliance Report outlines compliance and inspection efforts as specified by the Code for the calendar year of 2018. This report outlines the effectiveness of the Code by indicating the compliance of the industry to the requirements, the inspection efforts of FLR, the number of escapes (if any), and effectiveness of recapture efforts.

One of the objectives of the Code is to be forward-looking and seek continual improvement. This report will also indicate where improvements or revisions to the Code have been made. It should be noted that any and all revisions are undertaken with the full consultation of industry and both levels of government. The Aquaculture Liaison Committee meeting is the venue where such revisions are discussed.

The Code of Containment has also been recognized domestically and internationally for its adequacy in addressing the issue of escaped fish. The Code of Containment for the Culture of Salmonids in Newfoundland and Labrador is recognized as an effective and leading document that addresses containment and escapes in Canada.

2.0 INDUSTRY OVERVIEW:

The salmonid aquaculture industry in Newfoundland and Labrador in 2018 consisted of three companies growing Atlantic salmon and Steelhead trout with farming operations in both Bay D'Espoir and Fortune Bay. There were 88 sites licensed for Atlantic Salmon and Steelhead production in 2018 and 29 sites were in active production.

2018 was a difficult year for the salmonid farming industry in Newfoundland and Labrador. Production decreased from 18,822 MT in 2017 to 15,107 MT in 2018. Infectious Salmonid Anemia virus (ISAv) was present throughout many of the BMA's. As a measure to prevent the spread of the virus to the rest of the industry quarantine zones were established around the infected areas. These federally and provincially enforced quarantine areas prevented staff from inspecting many of the active sites.

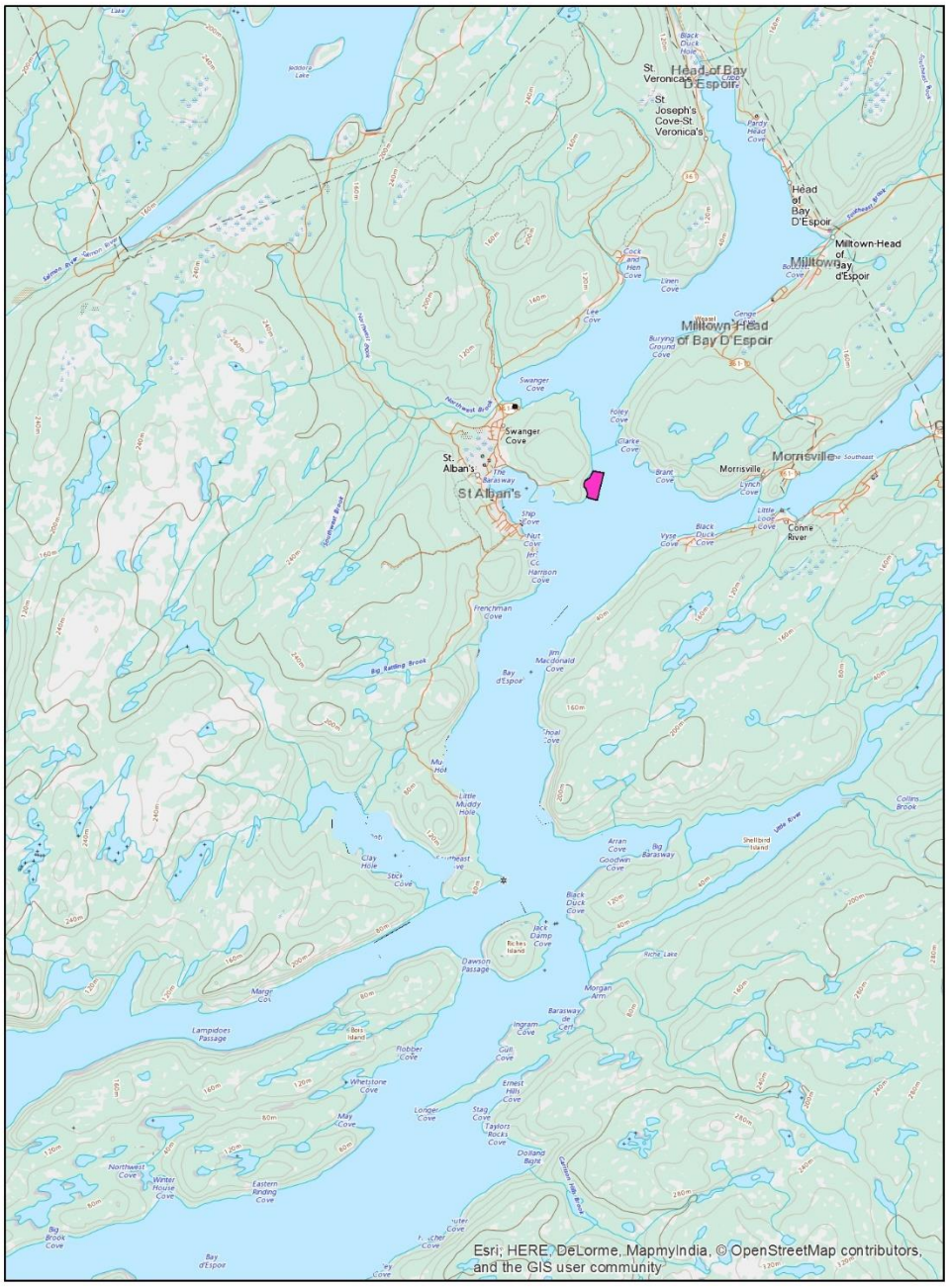
In 2013, the industry transitioned to a Bay Management Area (BMA) system. The BMA agreement was officially signed in 2014. The use of BMAs is a sound, scientifically- based and proven method of reducing disease and parasite impact. It also enables stable and orderly management of industry practices to ensure environmental sustainability. Active site locations as described below will now be reported via the BMA that they reside in.

Note: The rainbow trout growing area is not included in the BMA system.

2.1 Number of Active Sites in the Trout Growing Region of Bay D'Espoir

The following figure indicates the 1 site growing Rainbow Trout (Steelhead).

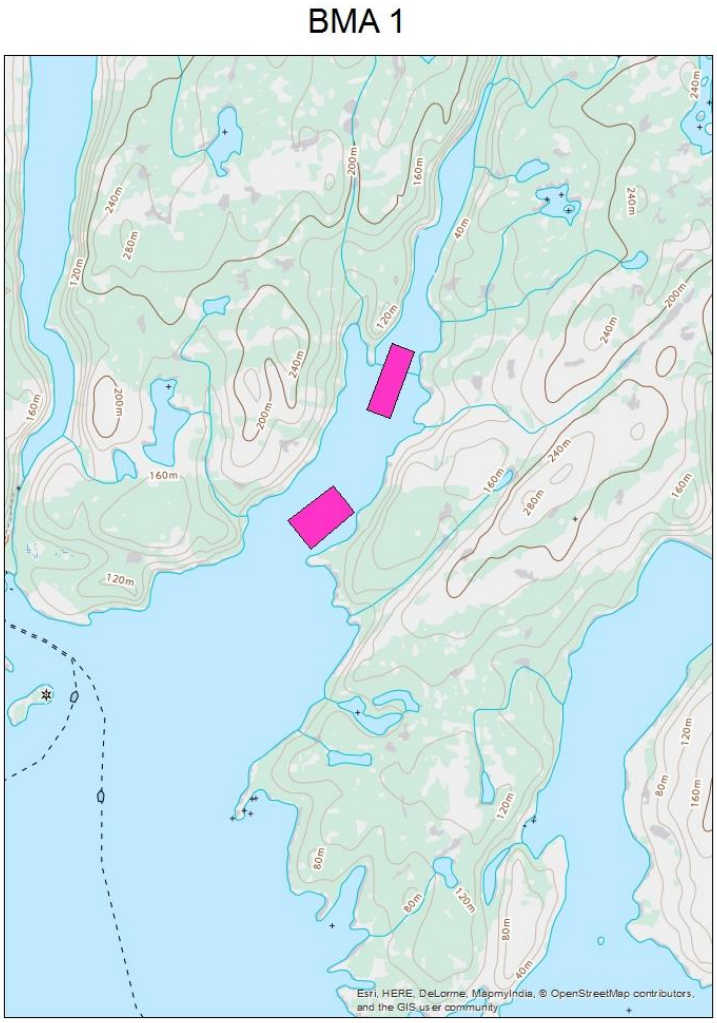
Figure 1: Active finfish sites in Bay D'Espoir Trout Growing Region in 2018.



2.2 Number of Active Sites in BMA 1 (Mal Bay/Fortune Bay East)

There were 2 active sites in BMA 1 growing Atlantic salmon.

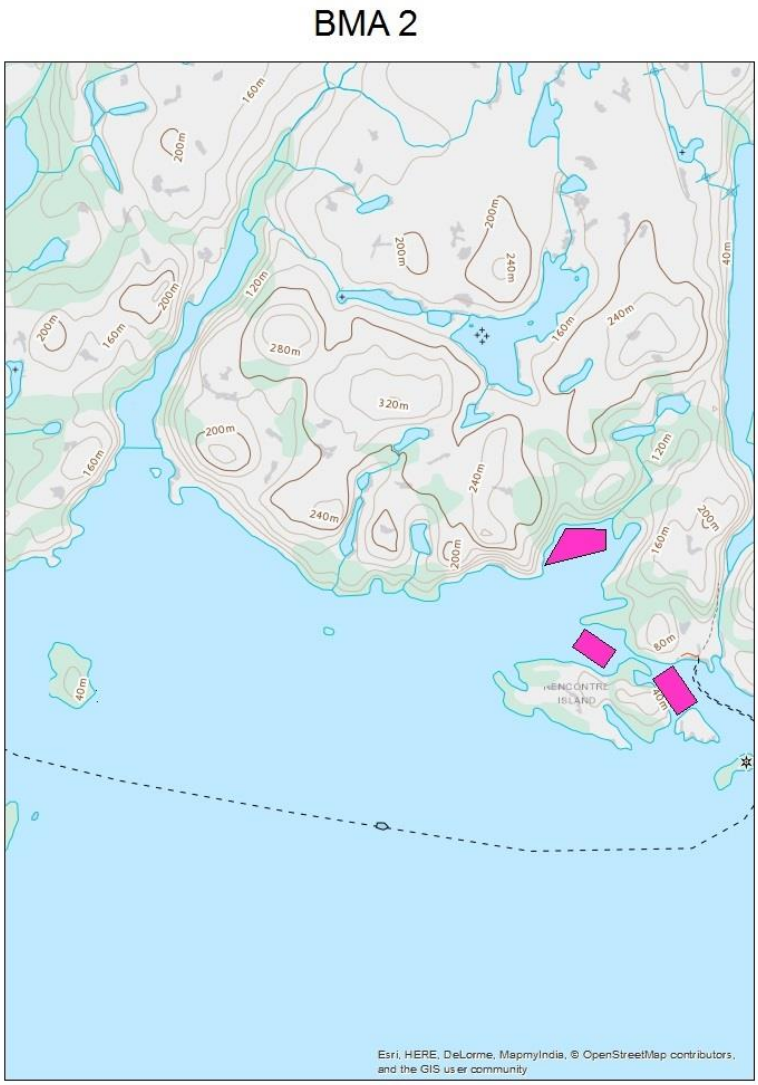
Figure 2: Active Finfish Sites in 2018.



2.3 Number of Active Sites in BMA 2 (Rencontre Island/Fortune Bay Centre)

There were 3 active sites in BMA 2 growing Atlantic salmon.

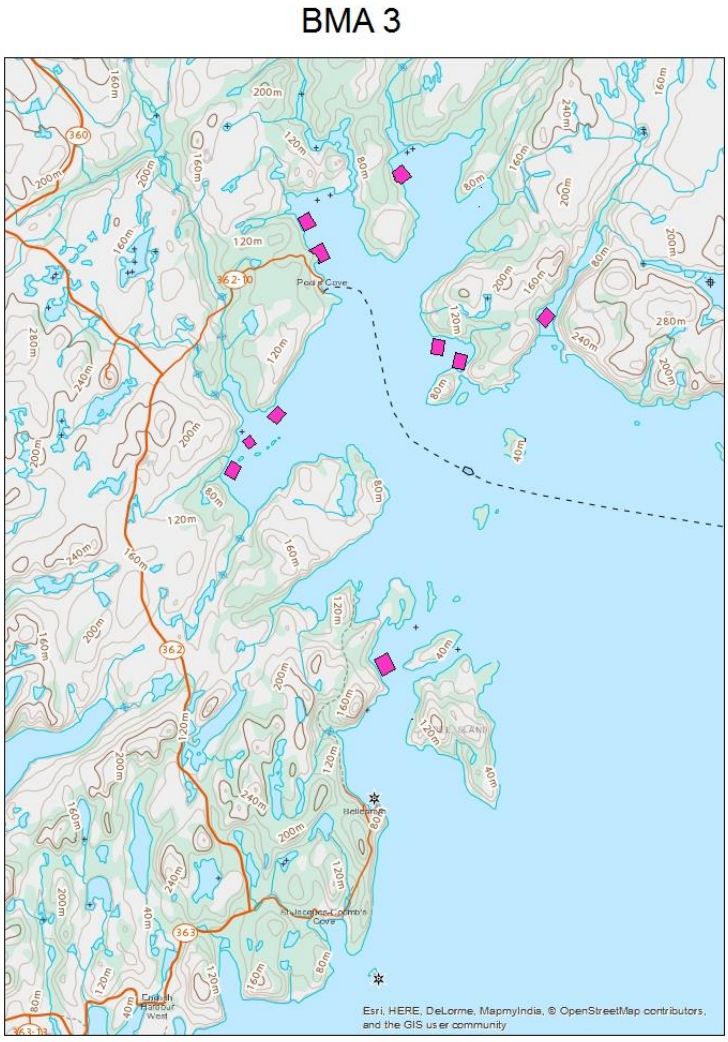
Figure 3: Active Finfish Sites in 2018.



2.4 Number of Active Sites in BMA 3 (Fortune Bay West)

There were 10 active sites in BMA 3 growing Atlantic salmon.

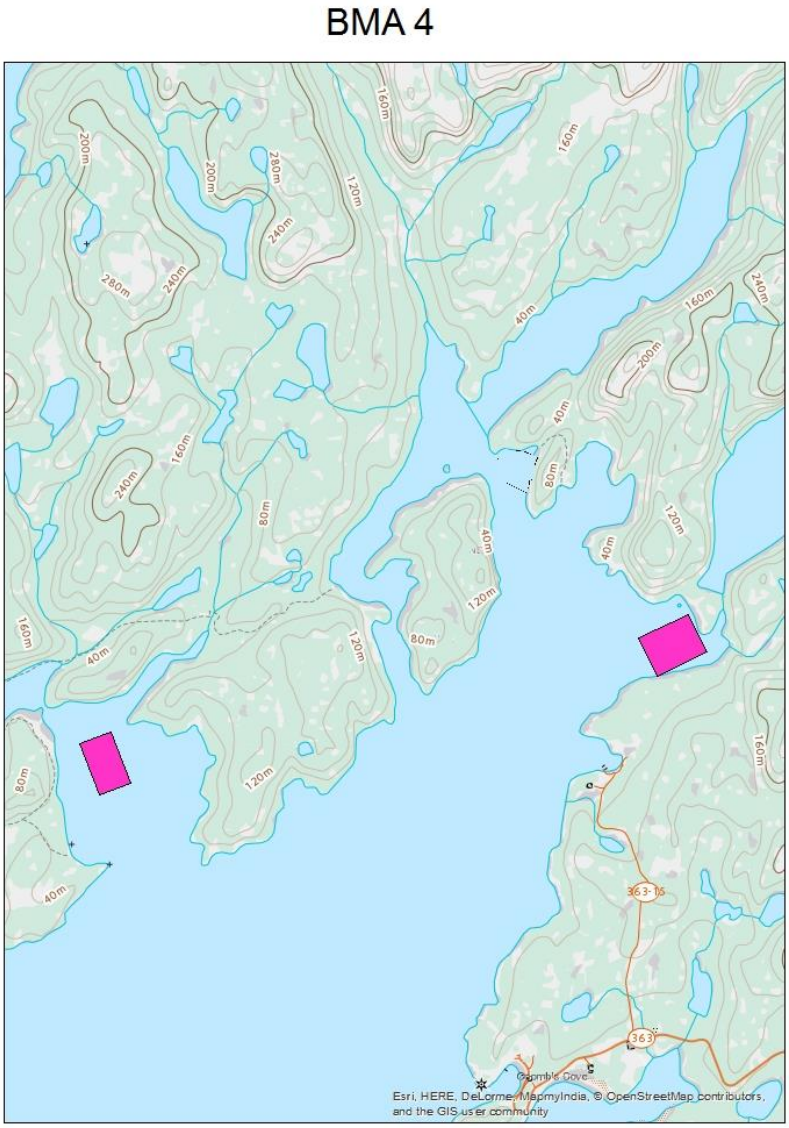
Figure 4: Active Finfish Sites in 2018.



2.5 Number of Active Sites in BMA 4 (Great Bay de l'Eau)

There were 2 active sites in BMA 4 growing Atlantic salmon.

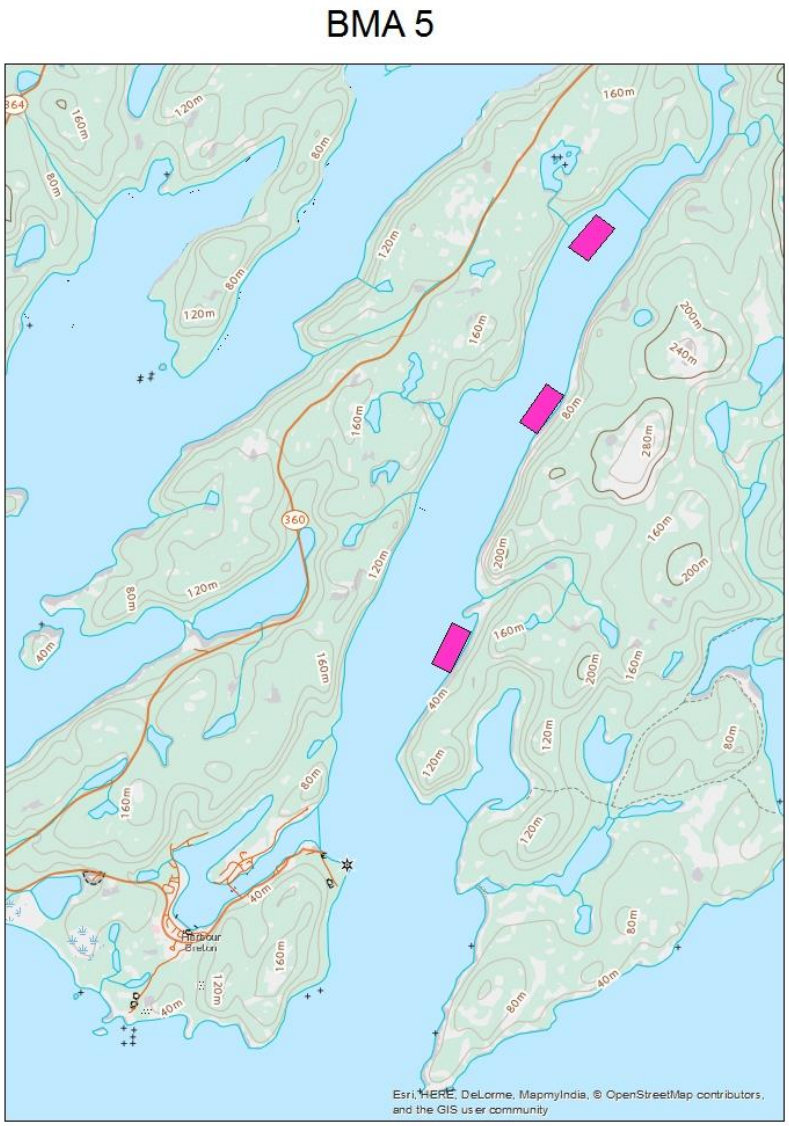
Figure 5: Active Finfish Sites in 2018.



2.6 Number of Active Sites in BMA 5 (Harbour Breton Bay)

There was 3 active sites in BMA 5 growing Atlantic salmon.

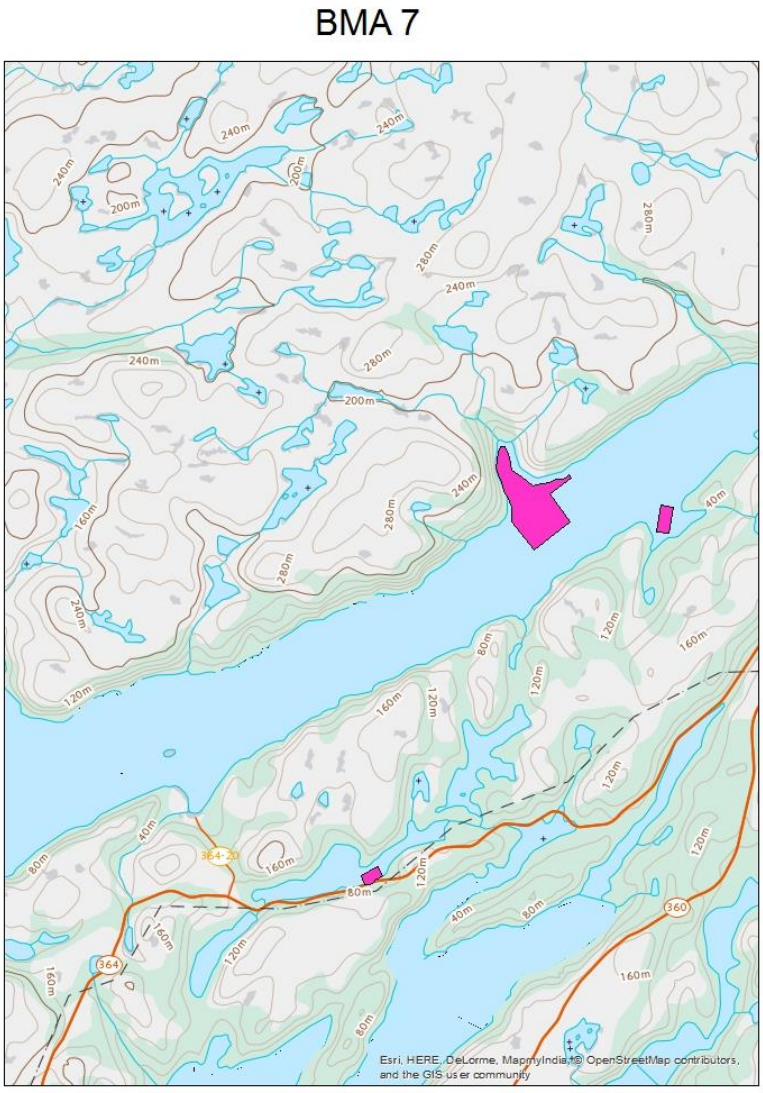
Figure 6: Active Finfish Sites in 2018.



2.7 Number of Active Sites in BMA 7 (Hermitage Bay)

There were 2 active sites in BMA 8 growing Atlantic salmon and 1 Freshwater site.

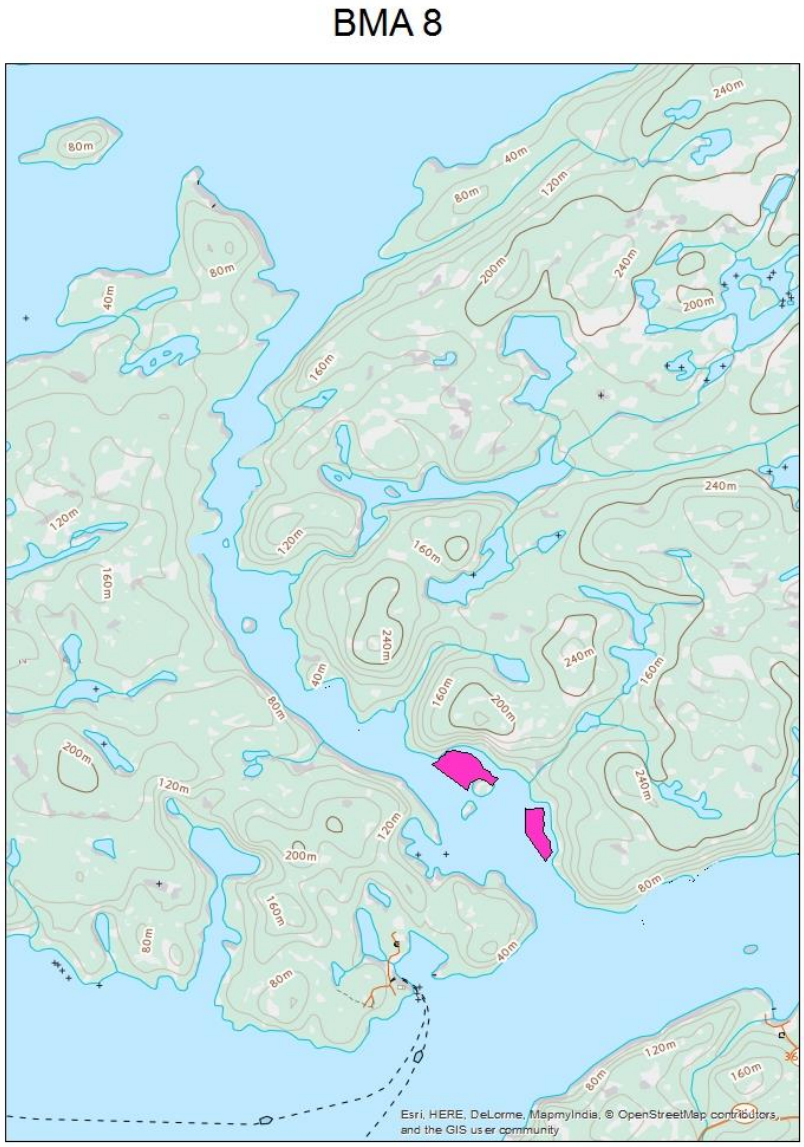
Figure 7: Active Finfish Sites in 2018.



2.8 Number of Active sites in BMA 8 (Long Passage)

There were 2 active sites in BMA 8 growing Atlantic Salmon.

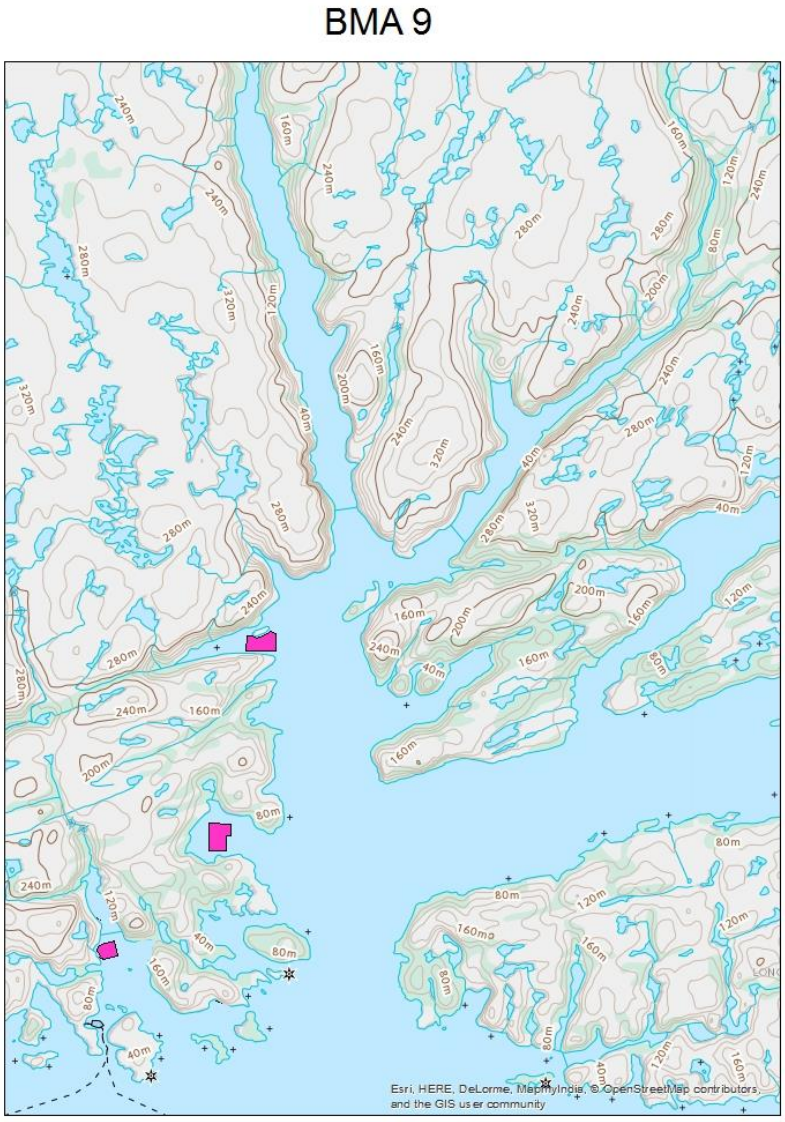
Figure 8: Active Finfish Sites in 2018.



2.9 Number of Active sites in BMA 9 (Bay d'Espoir)

There were 3 active sites in BMA 9 growing Atlantic Salmon.

Figure 9: Active Finfish Sites in 2018.



3.0 APPENDIX 1 - EQUIPMENT STANDARDS:

A1.1 Nets and Net Testing

This section of the Code of Containment addresses net strength and integrity. Historically, in Newfoundland and Labrador, the causes of escapes due to equipment failure decreased after the introduction of the Code. Since that period, in the majority of cases, escapes have been due to procedural breakdowns (e.g. when two nets are joined together in an improper manner resulting in the join failing and causing a hole in the net. The Newfoundland and Labrador Code of Containment focuses heavily on nets in both this section and in Appendix 4 - System Inspections. Specific requirements for nets and net testing can be found in Appendix A1.1, page 11 of the Code of Containment.

Compliance:
The nets used for finfish aquaculture along the south coast, made both locally and in New Brunswick, are of dyneema or a nylon knotless material and are, in most cases, treated with antifoulant. A new type of net material was introduced in past 2 years that utilizes a stainless steel core in the netting material.

Mesh sizes vary depending on the size of fish going into the cage. Nets over three years of age must be tested every 18 months. The following table provides a consolidated summary of the net inventories submitted by growers for 2018. See Page 17 of the Code for the 4 Point Stress Test Inspection form used for net testing. Please refer to Appendix A1.1, page 14 for net strength standards.

Net Inventories	Number of nets
Total number of nets in inventories	335
Number of nets over 3 years of age	242
Number of nets under 3 years of age	60
Number of nets of unknown age*	33
Number of nets audited	103
Nets in use during spring inspection**	69***
Nets in use during fall inspection**	26***

*Nets of unknown age are treated as if they are over three years. Therefore, they are required to be tested to determine if they are suitable for use as outlined under the Code. Nets under three years of age do not require testing.
** Refers to site System Inspections, see Appendix 4 of the Code of Containment and page 16 of this report.
***Low number of nets in use relative to inventory numbers is reflective of the abbreviated inspection schedule due to the prevalence of ISAv and resulting quarantine zones.

Not all nets in inventories are in active use at the same time. FLR has verified that nets in inventories in 2018 were tested by a net testing agent *or* were under three years of age. Each company's net inventory is audited to ensure nets are tested and to verify net age. Net

tag numbers are recorded during system inspections and cross-referenced with the net inventories each farm submits.

A1.2 Cage Types

Two types of cage designs were in use in 2018. The first and most common are the circular High Density Polyethylene (HDPE) plastic cages. These are manufactured locally to national and international industry standards and have proved to be very reliable in Newfoundland and Labrador and Labrador environment. They are manufactured in several sizes but are found most commonly in 70m, 90m, and 100m circumference sizes, as well as 150m. The second type used is square systems, made of both steel and HDPE; however, these are slowly being phased out of use in favour of the HDPE circular cages.

Compliance:
No new types of cage systems were deployed during 2018.

A1.3 Mesh Sizes

Industry continues to use mesh sizes that meet or exceed the minimum size retained per mesh size as determined in "Determination of the Appropriate Cage Mesh Size for Retention of Salmonid Juveniles" by the Memorial University of Newfoundland and Labrador's Marine Institute to determine the appropriate mesh size for containment of all life stages of salmon that will be introduced onto the farms. This study was completed in 2000 and verified industry practice. The industry was using appropriate mesh size prior to the study being completed. Mesh sizes of nets to be used during production are listed in the cage culture application form for all licensed sites. FLR does not perform audits or inspections on this aspect of the Code.

A1.4 Moorings

This section of the Code addresses mooring components. Mooring failure has not been identified as a cause of escapement in the Newfoundland and Labrador aquaculture industry. Mooring inspections are not currently covered under this Code. Attempts at mooring inspections were made in the past (via ROV) but they were impractical and did not yield reliable results. Mooring systems have changed substantially over the last number of years, with growers utilizing larger systems with more robust anchorage. Site holders monitor their own systems and regularly perform maintenance and replacement of the systems. The current Code requires that the grower submit a Mooring Maintenance and Replacement Plan annually for each site in production or newly installed mooring system. Additionally updated plans will be required upon replacement of a site system. See Form A.2 within the Code.

Compliance:
All Mooring Maintenance and Replacement Plans were submitted for sites in production in 2018.

4.0 APPENDIX 2 - INVENTORY MONITORING AND RECONCILIATION

Industry members are required to submit an annual inventory review to FLR for the calendar year. They are to be submitted at the beginning of the next calendar year (i.e. Inventory reconciliations for 2018 will be submitted in January/February 2019).

Compliance:
There was full compliance for the year 2018. Industry wide, the 2018 Inventory Reconciliations tracked four-year classes of fish, starting with an inventory total of 9,733,932 salmonids and ended with 8,422,965 salmonids. Data from growers indicated that there were both inventory shrinkages and inventory surpluses. Evidence of shrinkage or surplus is only experienced after a cage has been completely emptied by either harvesting or grading out (transfers). A FLR review of shrinkage and surpluses has shown that shrinkage and surpluses vary by species and year class of fish.

Table 2: Example of grower submitted Inventory Reconciliation.

Cage Number	Starting Number of fish	Year Class	Number of Fish Introduced	Number of Fish Mortalities	Number of Fish Removed/ Harvest	Number of Fish Removed/ Transfer	Counting Deviation	Number of Fish Escaped	Fish Remaining
101	76182	2017	0	12088	0	0	0	0	64094
102	77083	2017	0	5059	71835	0	-189	0	0
103	76491	2017	0	14719	21644	0	0	0	40128
104	79434	2017	0	11914	26880	0	0	0	40640
105	78351	2017	0	5412	79991	0	7052	0	0
106	73385	2017	0	12604	67978	0	7197	0	0
107	76707	2017	0	14259	70480	0	8032	0	0
108	71736	2017	0	22411	54818	0	5493	0	0
109	63893	2017	0	24230	43692	0	4029	0	0
110	66945	2017	0	17932	55483	0	6470	0	0
TOTAL	740207		0	140628	492801	0	38084	0	144862

Table 2 is an example of a particular cage grouping which shows a sample of the inventory reconciliation exhibiting both shrinkages and surplus (positive or negative deviations); counting deviations. The example illustrates the inherent errors involved in fish numbers. Counting deviations are a result of counting errors when stocking, grading or during mort removal. These are a result of the limitations inherent in the technology used to count the fish. Typically, with the most current technology, counting errors of up to 5% can be seen. These technological limitations result in over and under counting of a cages' population, or counting deviations. As seen in Table 2 above six cages exhibited a surplus and one had a shrinkage. Overall the site had a surplus of 38,084 animals. During their production cycle, from egg to being harvested, populations of fish are counted many times. Within a hatchery as the fish move through their growth cycle, from egg to smolt, and when they are moved to sea cage sites, hatcheries will count many times. As the fish are moved from the hatchery to sea cages, they are counted again, and this number is officially reported to

FLR. All mortalities that are retrieved over the course of the grow-out are noted and the final harvest numbers counted. All of this information is provided to FLR in the annually submitted Inventory Reconciliation. Additional sources of error include mortality that is not captured (winter mortality not recovered due to inclement weather and individual mortalities degradation). There are non-regulatory incentives for growers to maintain accurate inventory records including third-party certification bodies (i.e. Best Aquaculture Practices -https://www.bapcertification.org/) and for insurance purposes. Failure to maintain tight inventories will result in financial loss where these are concerned. Finally, each fish that is lost via escape in-of-itself results in a financial loss.

Code of Containment - Inventory Reconciliation -SPECIES – 20XX

Company Name:_____ Aquaculture Site Licence #'s:_____

Contact Name:_____ Site Locations:_____

Company Address:_____ Number of Active Cages:_____

Company Telephone: (709)_____ START DATE: January 1, 20XX

Company Fax: (709)_____ END DATE: December 31, 20XX Signature:

Cage Number	Starting Number of fish	Year Class	Number of Fish Introduced	Number of Fish Mortalities	Number of Fish Removed/Harvest	Number of Fish Removed/Transfer	Counting Deviation	Number of Fish Escaped	Fish Remaining
1									0
3									0
4									0
5									0
6									0
7									0
8									0
TOTAL									

Note: Sites used during this year included

Note: 1. Use additional pages as required.

5.0 APPENDIX 3 - ICE PROTECTION

The industry continues to use proven overwintering sites protected from moving ice.

Compliance

The industry has not applied for any new overwintering sites where moving ice may be an issue. The Code requires that new seasonal sites be reviewed by FLR for the potential of damage from moving ice. Any new seasonal sites may require ice booms. Existing overwintering sites at Roti Bay are proven sites protected from moving ice.

6.0 APPENDIX 4 - SYSTEM INSPECTIONS

The Code of Containment requires that the industry maintain ongoing inspections of their cage and mooring system structures. FLR is required to complete seasonal inspections on each site in operation usually in late spring and late fall after cages are secured on site for that growing period.

Season	Number of sites inspected	Number of cages/nets on site	Number of issues recorded
Spring	8	69	9
Fall	1	26	1

Low number of nets in use/number of inspections is reflective of the abbreviated inspection schedule due to the prevalence of ISAv and resulting quarantine zones.

Only sites that are engaged actively in culturing fish are inspected. In the instance that a site has been identified as having an infectious pathogen, and has been classified as under quarantine by the Canadian Food Inspection Agency (CFIA), FLR would not conduct inspections on this site as doing so would result in breaking the CFIA imposed quarantine. System inspections include:

1. Visually checking all nets near the surface for any holes and tears.
2. The tag number of each net is recorded.
3. Nets are checked to verify if they were tied into the cage collar.
4. Each cage on site is physically checked by completely walking around it and checking its condition. This includes checking the rails, stanchions and the cage collar for structural integrity, excessive wear and major cracks.
5. Surface moorings are visually checked for excessive wear and overall condition. This includes checking all visible lines, thimbles, shackles, chains, and compensator buoys.

Compliance:

Spring – There were 9 incidents recorded:

- 4 of the incidents were nets past their testing date. In all instances, FLR recommended harvesting begin to clean the fish out of the affected cages. FLR maintained a close watch on the sites in question to ensure this process was completed in a timely manner. All instances of nets past testing date were referred to enforcement and compliance.
- 5 of the incidents were either cage posts that were missing or cracked. Follow-up inspections confirmed all repairs necessary were completed or the cages in question were replaced. In all instances, the potential for escapes was minimal.

Fall – There was 1 incident recorded.

- 1 incident was either cage posts that were missing or cracked. Follow-up inspections confirmed all repairs necessary were completed or the cages in question were replaced. In this instance, the potential for escapes was minimal.

The industry fully cooperated with FLR during each site inspection.

7.0 APPENDIX 5 - PREDATOR CONTROL PLANS

Each aquaculture site requires a plan to deal effectively with predators because they can be responsible for creating holes in nets, which may contribute to escapement. Effective since the fall of 2002, Predator Control Plans were incorporated into all Aquaculture license applications.

Compliance:
Industry is fully compliant with this section of the Code. FLR has predator control plans for each site on record.

8.0 APPENDIX 6 - HANDLING PRACTICES

The salmonid industry handles fish in accordance with practices accepted industry wide that are humane and guard against escape of fish.

Compliance:
Industry is fully compliant with this section of the Code.

9.0 APPENDIX 7- MEASURES FOR THE RECAPTURE OF ESCAPED FISH

DFO is responsible for the monitoring and implementation of this section of the Code. A Rapid Response Licensing Policy for the recapture of escaped fish was put in place in the fall of 2002, replacing the former recapture plan of 1999 (please see current copy of the Code).

Since the Code of Containment has been in effect, escapes have decreased overall (see Table 3).

Table 3
REPORTED ESCAPES SINCE 1990

Year	Salmon	Steelhead	Charr
1990	0	6600	0
1991	0	1700	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	31000	0
1996	140000	4000	0
1997	0	0	0
1998	69500	93000	0
1999	6300	8000	0
2000	0	45000	0
2001	0	0	0
2002	0	0	0
2003	6500	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0
2007	500	4400	0
2008	0	39653	0
2009	300	0	0
2010	0	32,443	69,827
2011	0	12,382	0
2012	0	0	0
2013	20,800	0	7513
2014	0	0	0
2015	1000	1000	0
2016	0	0	0
2017	<100	0	0
2018	3000	0	0

The current approach to recapture as specified in the Rapid Response Licensing Policy has never been proven very effective in actual escape events. There have been problems with fishing gear, delays between detection of losses and deployment of fishing gear, problems with subordination of recapture responsibilities to other on farm priorities following escapement incidents , and policy limits that restricts fishing effort to the cage site only.

DFO is currently conducting research into the fate and behavior of escaped farmed salmon to help guide recapture methods. In 2013, efforts were undertaken by the Code of Containment Liaison Committee members to update this section of the code. A section on Post Escape Reporting which includes provisions for reviewing the incident and its cause, whether the recapture efforts were successful and how/if the incident could have been prevented.

Compliance

One of the growers, after the installation of a periscope net to apply a non-therapeutic sea lice treatment, discovered that the join between the periscope net and cage was not completed properly. The installation required the sewing of net extensions to the existing net to allow lowering of the regular net with a lice shield. This technology effectively installs a ceiling on the top of the growout net that is lowered, effectively keeping salmon out of the surface waters where sea lice are prevalent.

A couple of days later nearby communities reported that farmed salmon were being observed. The grower followed up with divers onsite the next day and confirmed that two sections approximately five feet in length where the extension was sewn had let go. This was corrected immediately, and the company reported the escape to DFO as required by the Code of Containment. Escape recapture efforts were initiated when DFO provided permission resulting in 400 animals being recovered. The grower has reported in their annual submission of Inventory Reconciliations that 3000 fish escaped.

After the incident, the grower has modified their procedures for overseeing net sewing to require both Area Manager and Site Manager to inspect sewing before any extensions are lowered into the water. Additionally, results of these inspections must be sent to the Production Manager prior to dropping nets into the water.

Glossary of Terms:

Cage – The floating structure in which nets are hung from. Construction materials include galvanized steel and PVC.

Cage collar – Main attachment point for net and mail floatation for the cage structure. Any damage to this portion of the cage is of immediate concern for escapes.

Compensator buoy – A part of the mooring system that is key in ensuring that cages do not submerge as the buoyancy in the buoy has to be overcome before the cage will sink.

Hand Rail – Section of the cage from which the Jump net is suspended.

Jump net – The portion of the net that extends up from the main attachment point to hang from the handrail. Its purpose is to prevent escapes from leaping salmon.

Net – Actual containment structure. Consists of the follow sections: net panels x 4 (four sides and bottom) and the jump net.

Stanchion/post – Vertical post from the cage collar that supports the handrail.