Annual Compliance Report - 2017

on the

Code of Containment

for the Culture of Salmonids in
Newfoundland and Labrador

Department of Fisheries and Land Resources
Aquaculture Development Branch

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EXECUTIVE SUMMARY:

The Newfoundland and Labrador salmonid aquaculture industry continues to experience growth. 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 2017. Inspections occurred on the 31 active aquaculture sites between May and January. Reporting and inspection results are summarized below:

Nets and Net Testing:
353 nets were recorded in grower's net inventories in 2017. FLR staff recorded 282 nets on sites in the spring and 263 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 9,508,074 salmonids and ended with 9,733,932 salmonids.

Ice Protection: There were no new overwintering sites utilized in 2017.

System Inspections: FLR performed 27 site inspections in spring and 22 in the fall. 44 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: 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. Current DFO research can assist these discussions.

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 2017. 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 2017 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 2017 and 31 sites were in active production.

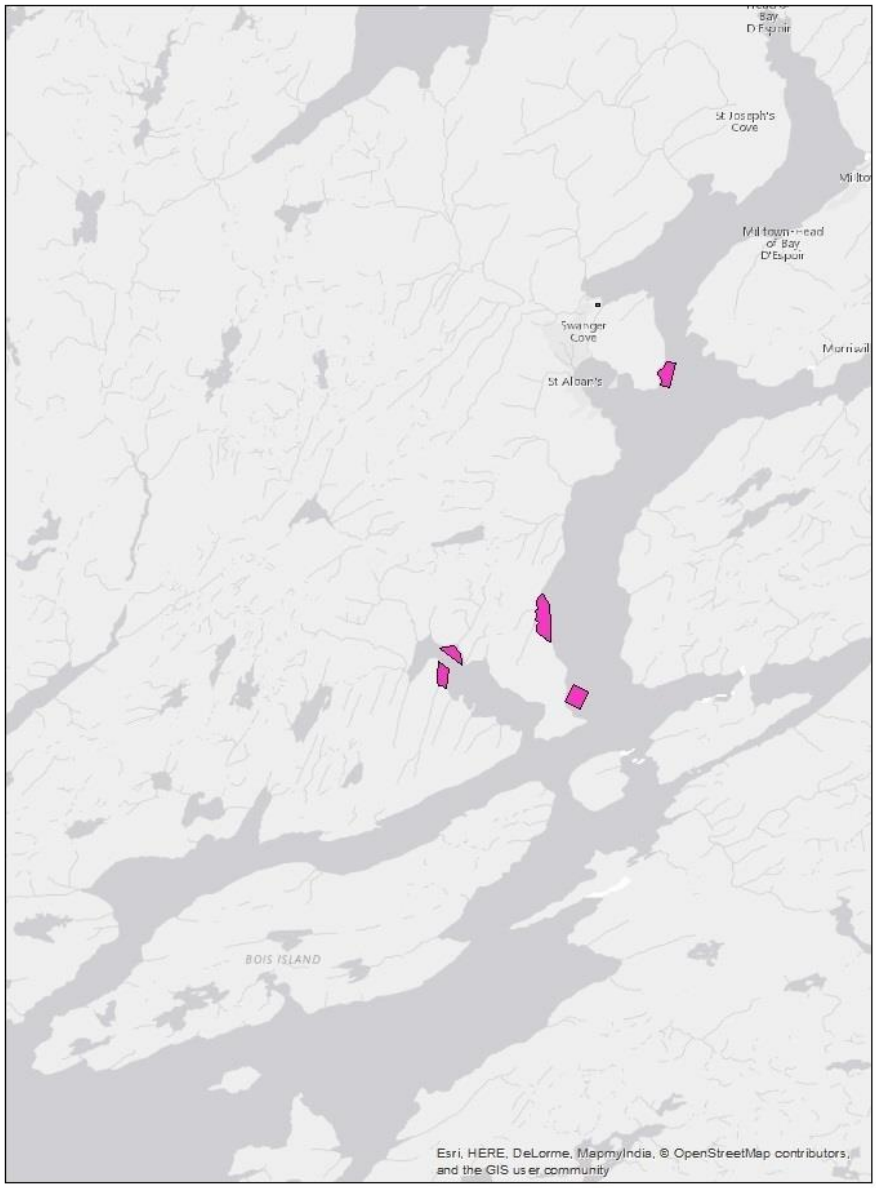
In 2013, the industry transitioned to a Bay Management Area (BMA) system, The BMA agreement was officially signed in 2014. The use of BMAs is a sound, scientifically-based and proven method of reducing disease and parasite impact. It also enables stable and orderly management of industry practices to 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 in 2017

The following figure indicates the 5 sites growing Rainbow Trout (Steelhead).

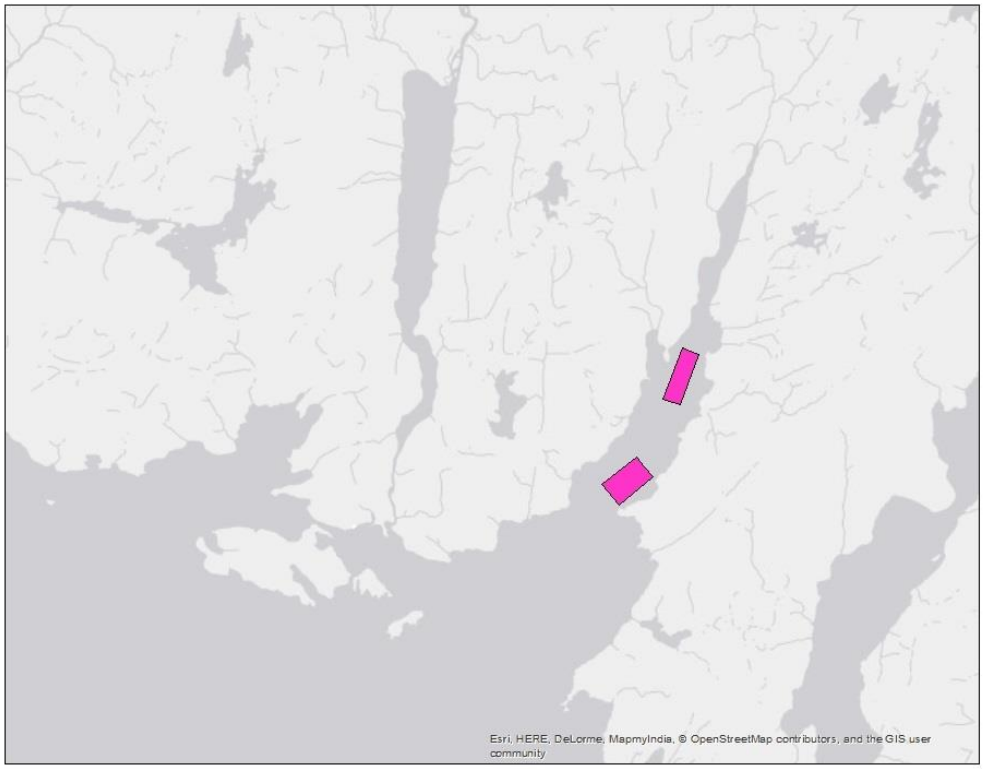
Figure 1: Active finfish sites in Bay D'Espoir Trout Growing Region in 2017.



2.2 Number of Active Sites in from BMA 1 (Mal Bay/Fortune Bay East) in 2017

There were 2 active sites in BMA 1 in 2017 growing Atlantic salmon.

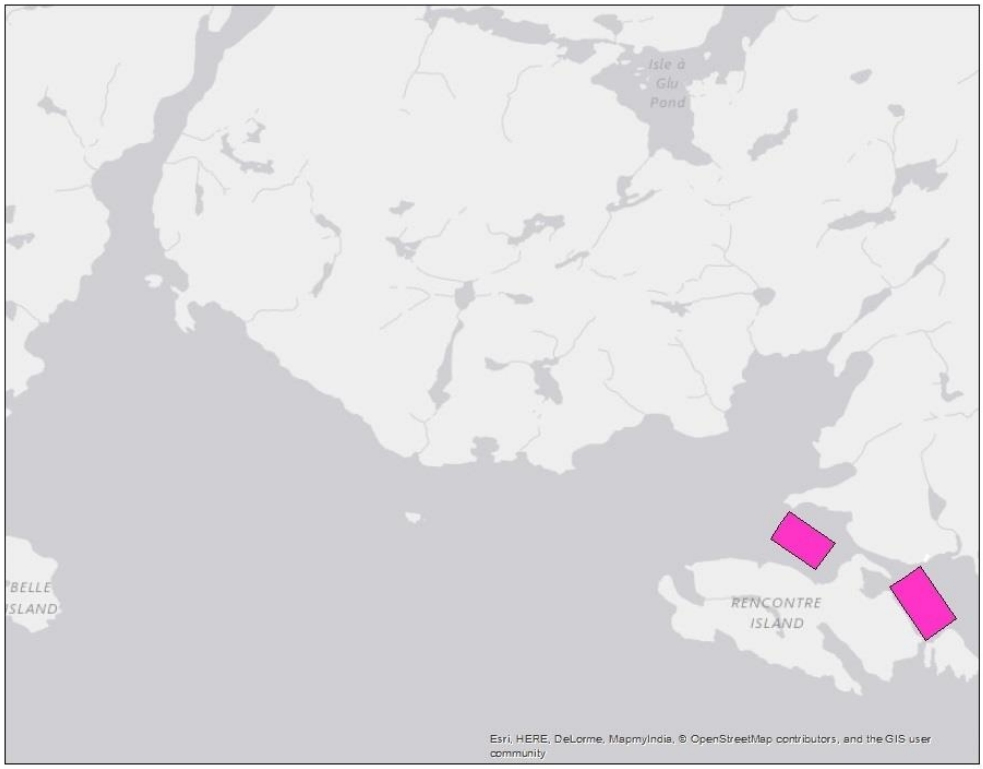
Figure 2: Active Sites in from BMA 1 (Mal Bay) in 2017.



2.3 Number of Active Sites BMA 2 (Rencontre Island/Fortune Bay Centre) in 2017

There were 2 active sites in BMA 2 in 2017 growing Atlantic salmon.

Figure 3: Active finfish sites in BMA 2 in 2017.



2.4 Number of Active Sites in BMA 3 (Fortune Bay West) in 2017

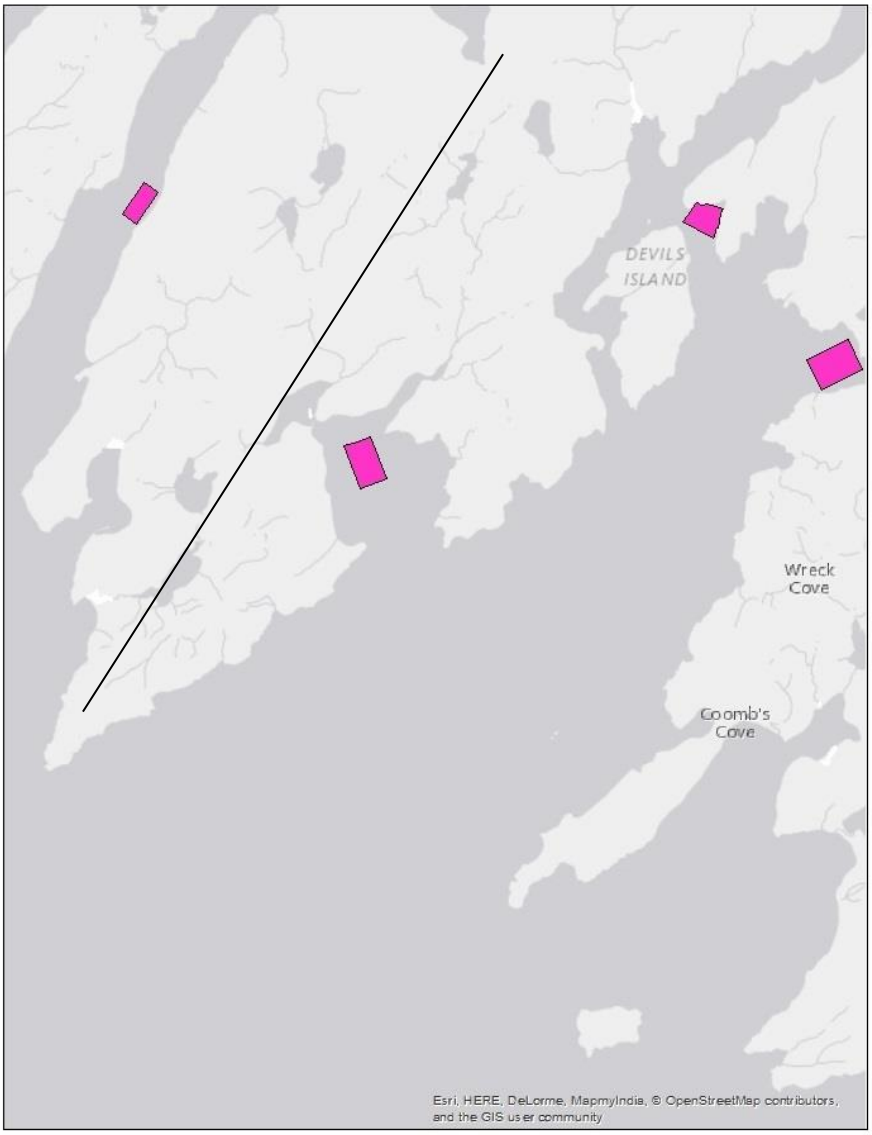
There were 9 active sites in BMA 3 in 2017 growing Atlantic salmon.

Figure 4: Active finfish sites from BMA 3 in 2017.

2.5 Number of Active Sites in BMA 4 (Great Bay de l'Eau) and BMA 5 (Harbour Breton Bay) in 2017

There were 3 active sites in BMA 4 and 1 in BMA 5 in 2017 growing Atlantic salmon.

Figure 5: Active finfish sites from BMA 4 and 5 in 2017.



2.6 Number of Active Sites in BMA 6 (Connaigre Bay) and BMA 7 (Hermitage Bay) in 2017

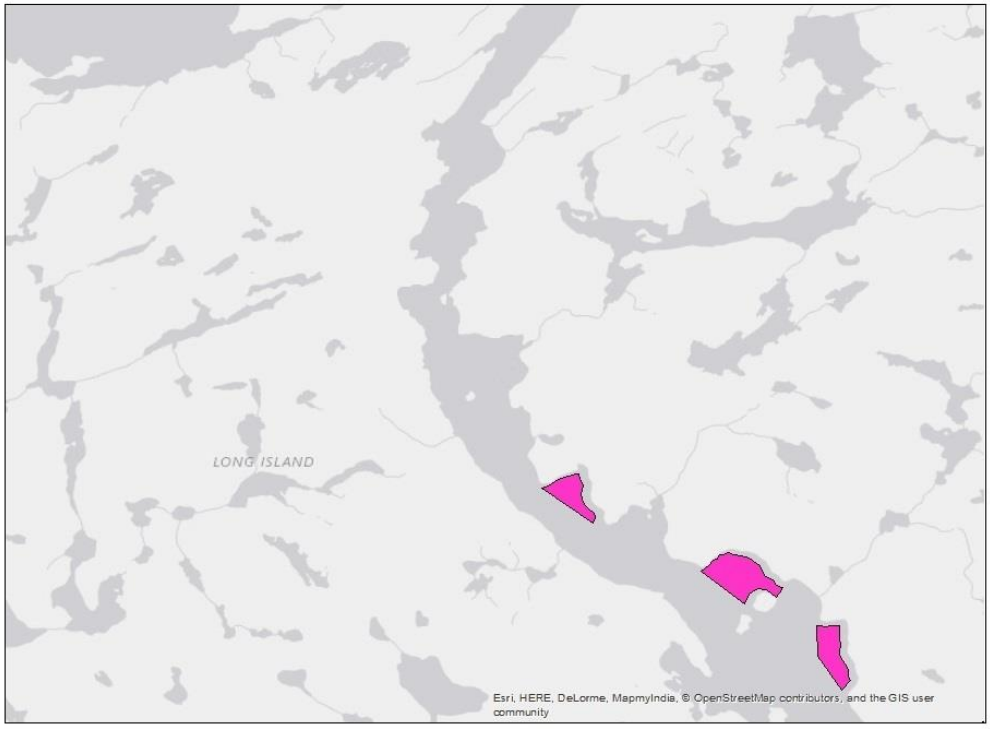
There was 1 active site freshwater in BMA 6 (Long Pond Nursery) and 2 active marine sites in BMA 7 in the 2017 growing Atlantic salmon.

Figure 6: Active finfish sites from BMA 6 and 7 in 2017.

2.7 Number of Active Sites in BMA 8 (Long Passage) in 2017

There were 3 active sites in BMA 8 in 2017 growing Atlantic salmon.

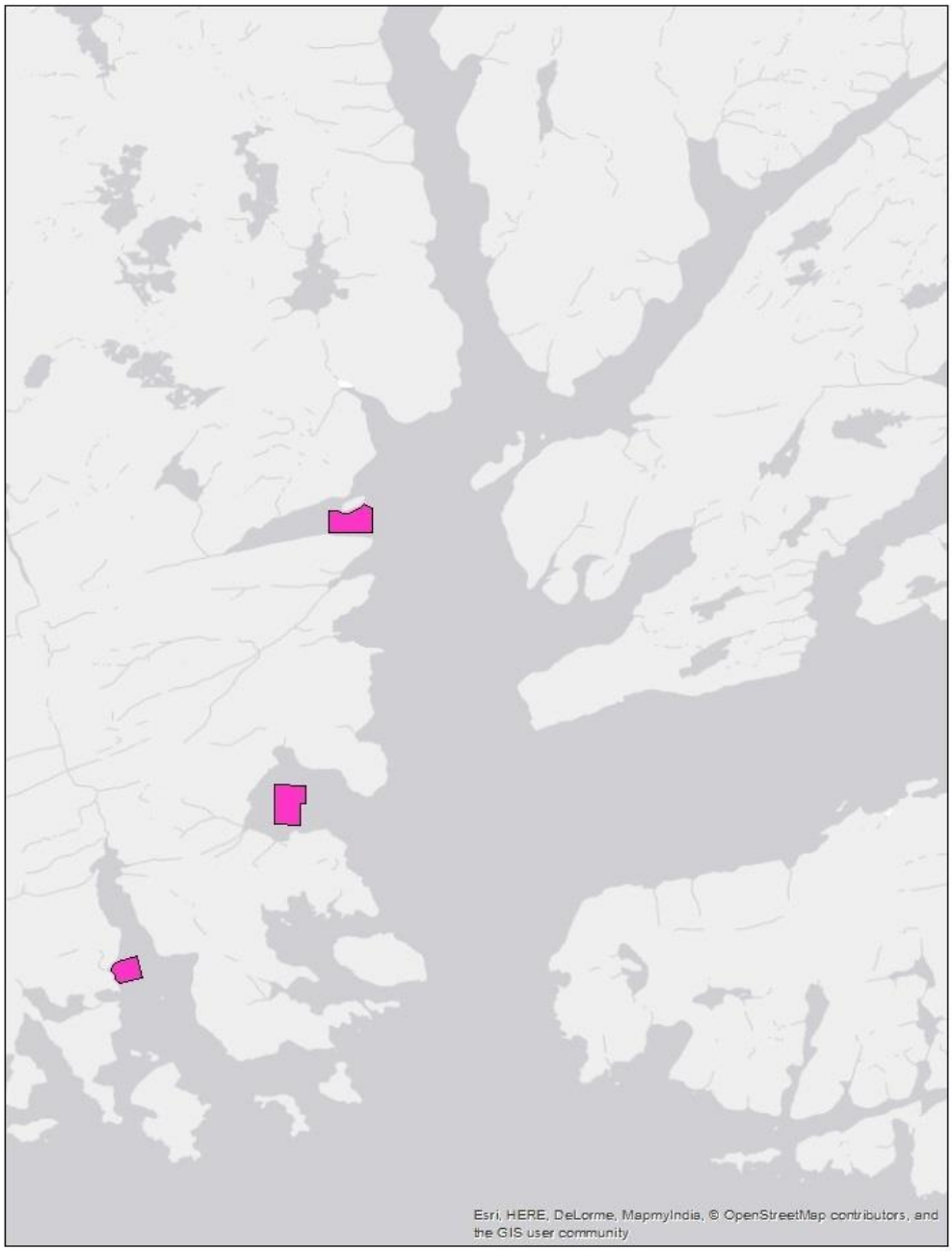
Figure 7: Active finfish sites from BMA 8 in 2017.



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

There were 3 active sites in BMA 9 in 2017 growing Atlantic Salmon.

Figure 8: Active finfish sites from BMA 9 in 2017.



3.0 APPENDIX 1 - EQUIPMENT STANDARDS:

A1.1 Nets and Net Testing

This section of the Code of Containment addresses net strength and integrity. Equipment failure, in particular, net failure, has been recognized as a leading cause of escape incidents internationally. The Newfoundland 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 this past year 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 2017. See Appendix C for 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	353
Number of nets over 3 years of age	266
Number of nets under 3 years of age	73
Number of nets of unknown age*	14
Number of nets audited	184
Nets in use during spring inspection**	282
Nets in use during fall inspection**	263

*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.

Not all nets in inventories are in active use at the same time. FLR has verified that nets in inventories in 2017 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 2017. 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 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 2017.

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'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 in the last two 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.6 within Code.

Compliance:
All Mooring Maintenance and Replacement Plans were submitted for sites in production in 2017.

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 2017 will be submitted in January/February 2018).

Compliance:
There was full compliance for the year 2017. Industry wide, the 2017 Inventory Reconciliations tracked four-year classes of fish, starting with an inventory total of 9,508,074 salmonids and ended with 9,733,932 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

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	30961	2016	6114	3490					33585
2	31461	2016	5597	3695					33363
3	32864	2016	3865	2152					34577
4	33136	2016	4259	2771					34624
5	32973	2016	4100	2336					34737
6	33156	2016	4320	4145					33331
15	35843	2016		2381					33462
16	36982	2016		948		36034			0
16A		2016	34543	986					33557
17	47457	2016		3494	9369				34594
18	37718	2016		2477					35241
19	47258	2016		5204	8420				33634
20	37688	2016		1960		35728			0
20A		2016	34590	1540					33050
21	46561	2016		3379	8124				35058
22	46288	2016		3701	7686				34901
23	46548	2016		4356	8754				33438
24	49325	2016		2629	11711				34985
25	46461	2016		3097	8781				34583
26	49734	2016		2790	11742				35202
27	49308	2016		3706	11707				33895
28	49155	2016		2932	11094				35129
TOTAL	**820877**		**97388**	**64169**	**97388**	**71762**	**0**	**0**	**684946**

*Empty/blank spaces have a value of 0 (zero). In the columns "Number of Fish Introduced" and "Number of Fish Removed/Harvested the totals of 97,388 indicate fish that were graded for size and transferred between cages within the site. In the column "Number of Fish Removed/Transferred" indicate fish that were removed from the site completely.

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 been seen. These technological limitations result in over and under counting of a cages' population, or counting deviations. 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	27	282	28
Fall	22	263	16

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 visually checking all nets near the surface for any holes and tears. The tag number of each net is recorded. Nets are also checked to verify if they were tied into the cage collar. 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. Surface moorings are also visually checked for excessive wear and overall condition. This includes checking all visible lines, thimbles, shackles, chains, and compensator buoys.

Two sites were not inspected during the fall inspection round due to inclement weather during time periods were staff were available.

Compliance:

Spring – There were 28 incidents recorded:

- 15 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.

- 8 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.
- 2 issues were holes high in the jump net (no potential for escape) or sunken buoys. All were re-inspected during the fall inspections to ensure that they were rectified.
- 3 issues were untied waterlines. FLR staff directed that the waterlines be tied at times of the inspection.

Fall – There were 16 incidents recorded.

- 6 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.
- 7 issues were holes high in the jump net (no potential for escape) or broken jump net head ropes. All were re-inspected to ensure that they were rectified.
- 3 issues were untied waterlines. FLR staff directed that the waterlines be tied at time of the inspection.

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 in 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		6600	
1991		1700	
1992			
1993			
1994			
1995		31000	
1996	140000	4000	
1997			
1998	69500	93000	
1999	6300	8000	
2000	0	45000	
2001	0	0	
2002	0	0	
2003	6500	0	
2004	0	0	
2005	0	0	
2006	0	0	
2007	500	4400	
2008		39653	
2009	300		
2010		32,443	69,827
2011		12,382	
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

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.

There has been little work done since 2000/01 towards improving recapture methods and technology. 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 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

- *There was one reported escape in 2017 at a freshwater nursery site. The pond is landlocked and without an anadramous salmon or landlocked ouananiche population, DFO has stated that they consider the lost fish to be ouananiche pursuant to the Newfoundland and Labrador Fisheries Regulations. Consequently, they authorized retention angling in the pond using the current bag limit of 12 fish per day and a possession limit of twice the daily bag limit. The grower in question indicated that less than 100 fish were lost. The site in question reported a surplus counting deviation in its 2017 Inventory Reconciliation.

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.

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

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

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.

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

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.