Annual Compliance Report - 2016

on the

Code of Containment

for the Culture of Salmonids in
Newfoundland and Labrador

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EXECUTIVE SUMMARY:

The Newfoundland and Labrador salmonid aquaculture industry continues to experience growth. Production has increased from 19,684 MT in 2015 to 28,622 MT in 2016. 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 2016. Inspections occurred on the 37 active aquaculture sites between May and January. Reporting and inspection results are summarized below:

Nets and Net Testing: 453 nets were recorded in grower's net inventories in 2016. FLR staff recorded 319 nets on sites in the spring and 255 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 11,452,165 salmonids and ended with 9,508,074 salmonids.

Ice Protection: There were no new overwintering sites utilized in 2016.

System Inspections: FLR performed 30 site inspections in spring and 24 in the fall. 45 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: During a code inspection, the FLR inspector noted that a sea lice count was being completed without the use of a drop net in violation of Code handling practices. The company was informed that this practice was unacceptable and that in the future the company must adhere to all elements of the Code, where handling of fish occurs outside of a cage, and that drop nets were to be used without exception.

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 2016. 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 has also been recognized domestically and internationally for its adequacy in addressing the issue of escaped fish.

2.0 INDUSTRY OVERVIEW:

The salmonid aquaculture industry in Newfoundland and Labrador in 2016 consisted of four companies growing Atlantic salmon and Steelhead trout with farming operations in both Bay D'Espoir and Fortune Bay. There were 91 sites licensed for Atlantic Salmon and Steelhead production in 2016. 37 sites were in active production.

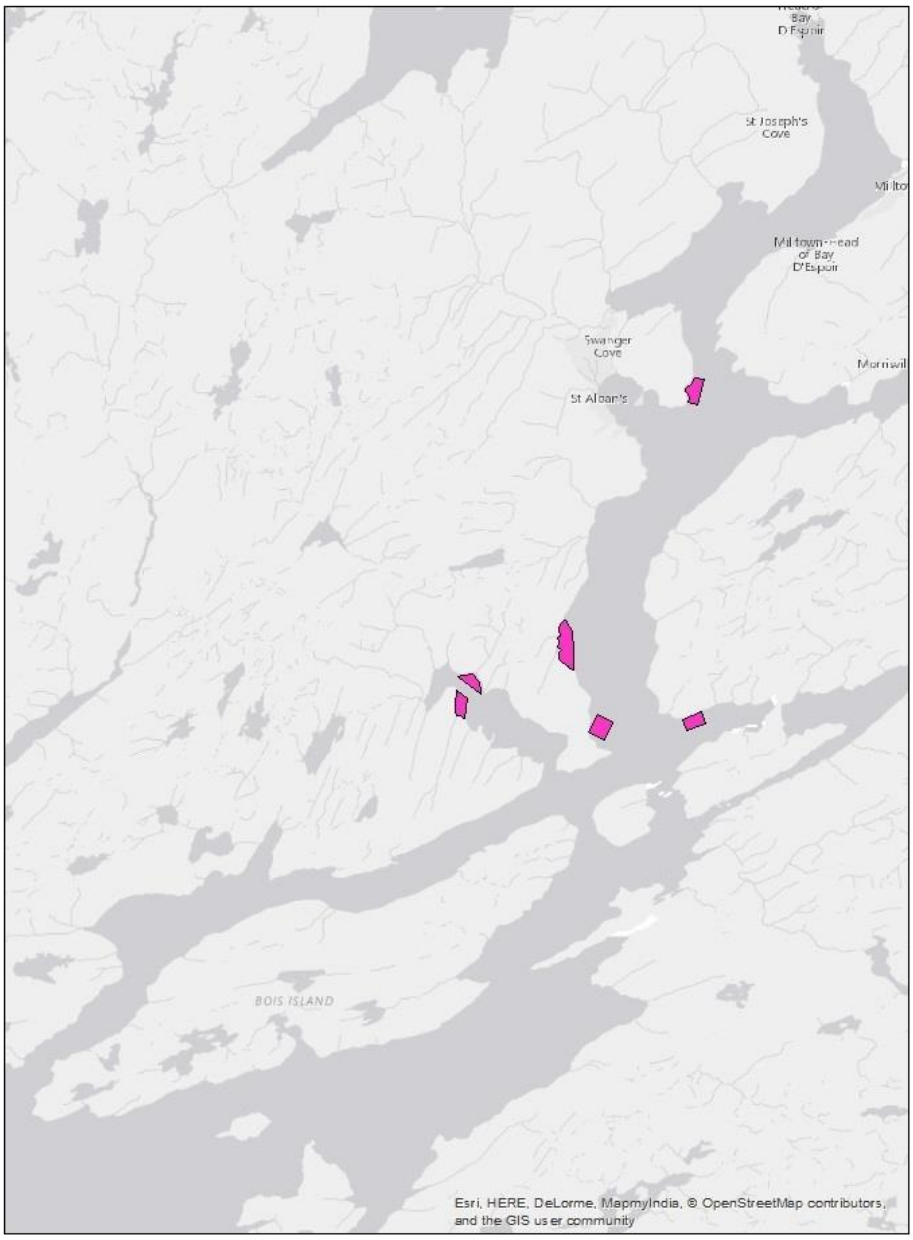
In 2013, the industry transitioned to a Bay Management Area (BMA) system, The BMA agreement was officially signed in 2014. The use of BMAs is a sound, scientifically- based and proven method of reducing disease and parasite impacts. It also enables stable and orderly management of industry practices 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 2016

In 2016, there were six active sites (currently farming fish). The following figure indicates the six sites growing Rainbow Trout (Steelhead).

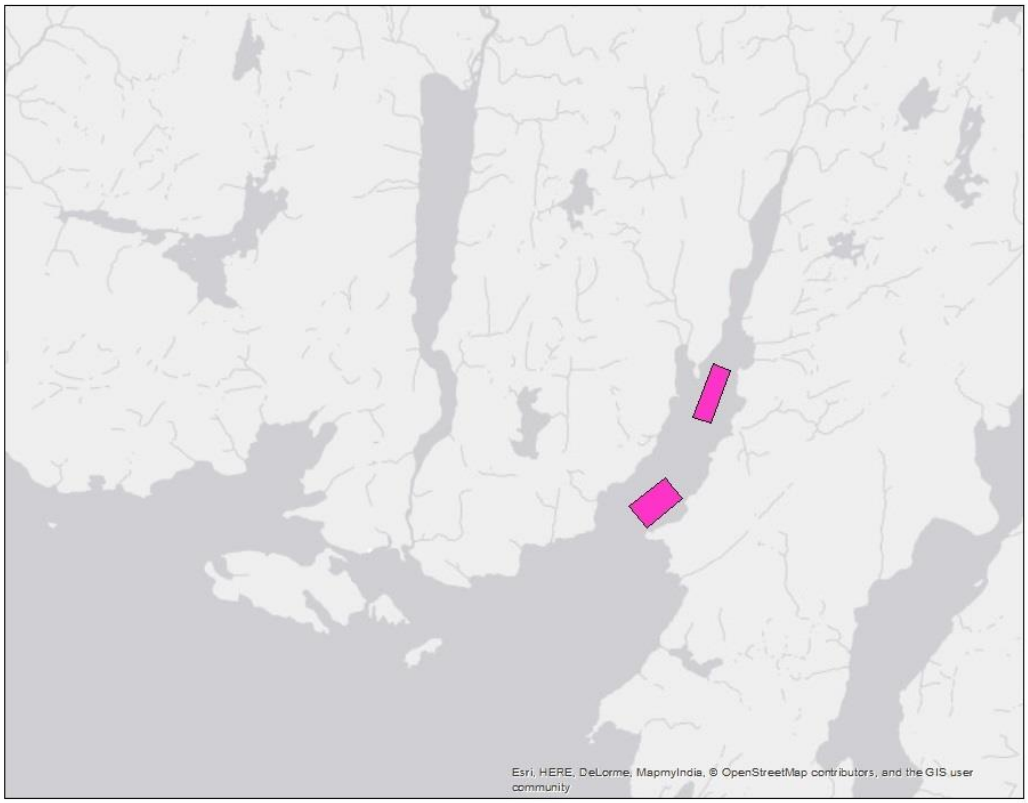
Figure 1: Active finfish sites in Bay D'Espoir Trout Growing Region in 2016.



2.2 Number of Active Sites in from BMA 1 (Mal Bay/Fortune Bay East) in 2016

There were two active sites in BMA 1 in 2016 growing Atlantic salmon.

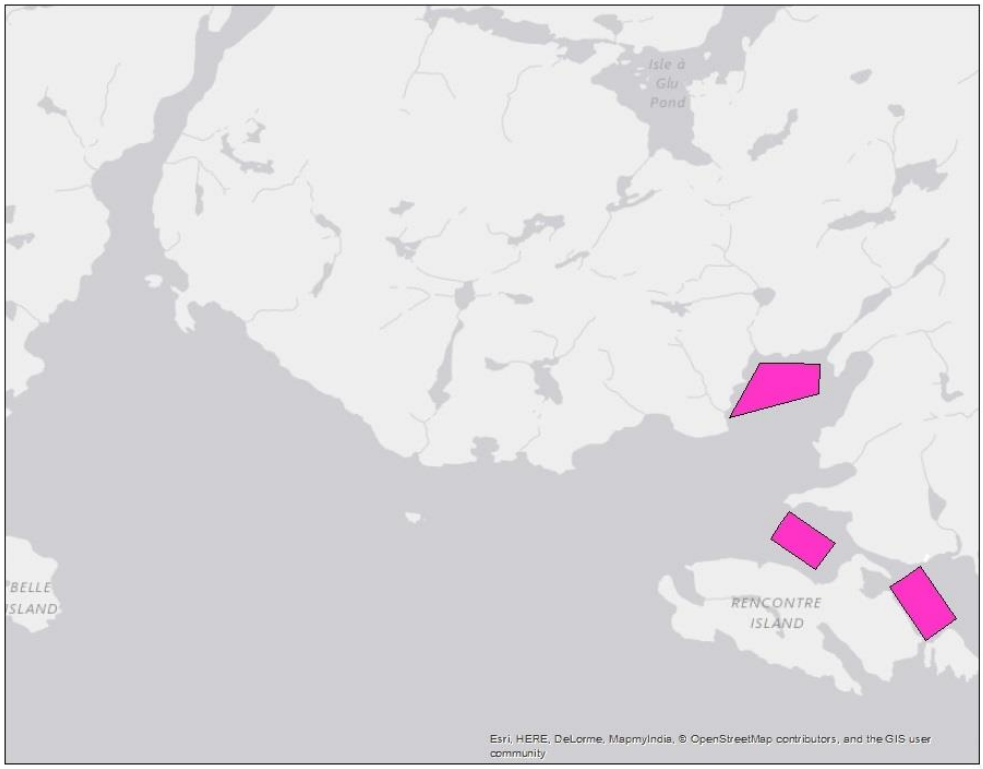
Figure 2: Active Sites in from BMA 1 (Mal Bay) in 2016.



2.3 Number of Active Sites BMA 2 (Rencontre Island/Fortune Bay Centre) in 2016

There were three active sites in BMA 2 in 2016 growing Atlantic salmon.

Figure 3: Active finfish sites in BMA 2 in 2016.



2.4 Number of Active Sites in BMA 3 (Fortune Bay West) in 2016

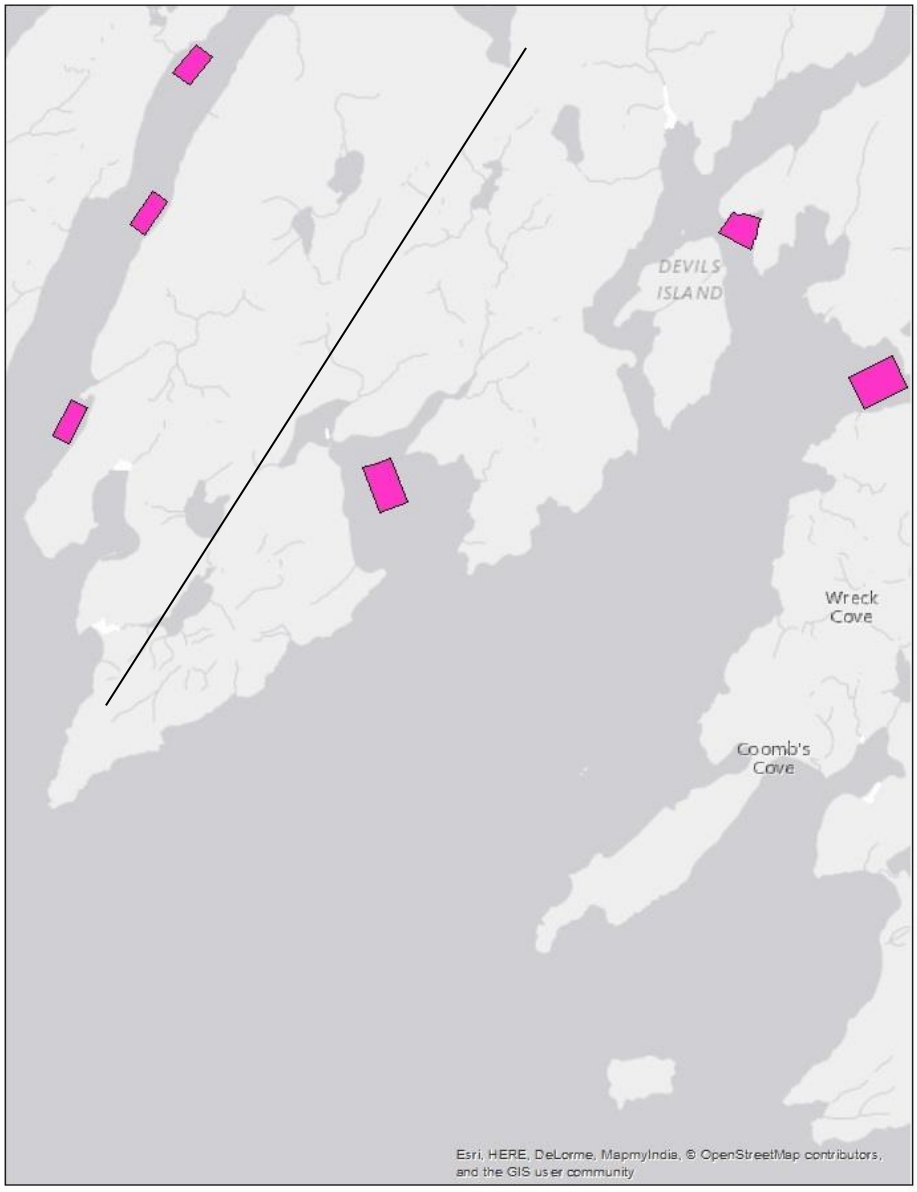
There were eight active sites in BMA 3 in 2016 growing Atlantic salmon.

Figure 4: Active finfish sites from BMA 3 in 2016.

2.5 Number of Active Sites in BMA 4 (Great Bay de l'Eau) and BMA 5 (Harbour Breton Bay) in 2016

There were three active sites in BMA 4 and three in BMA 5 in 2016 growing Atlantic salmon.

Figure 5: Active finfish sites from BMA 4 and 5 in 2016.



2.6 Number of Active Sites in BMA 6 (Connaigre Bay) and BMA 7 (Hermitage Bay) in 2016

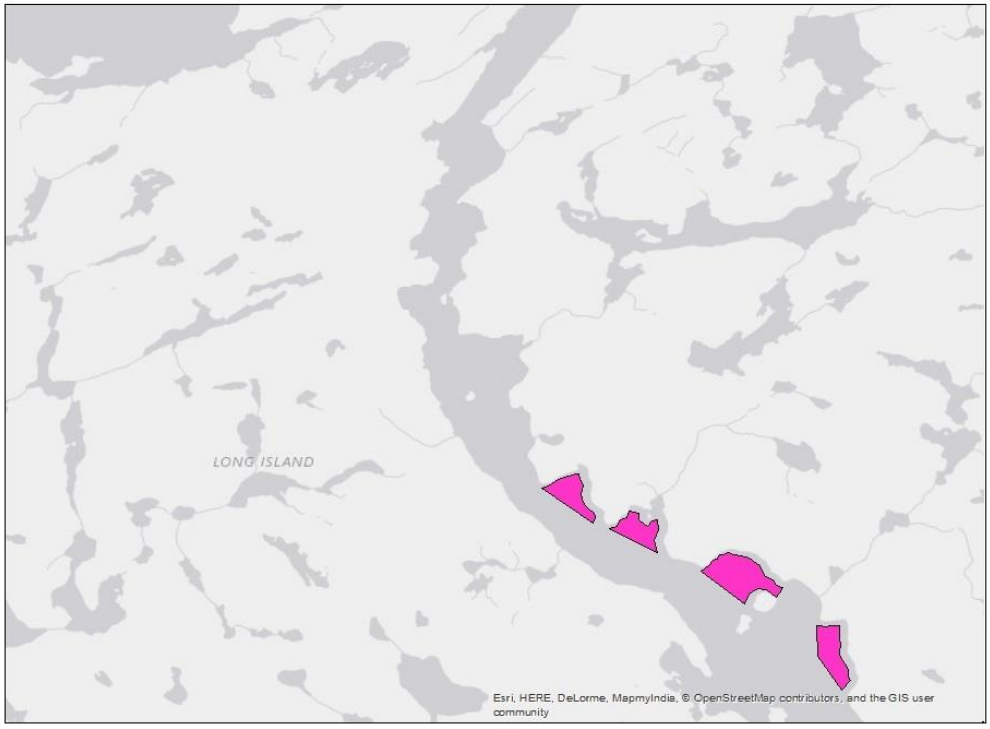
There was one active freshwater site in BMA 6 (Long Pond Nursery) and three active marine sites in BMA 7 in the 2016 growing Atlantic salmon.

Figure 6: Active finfish sites from BMA 6 and 7 in 2016.

2.7 Number of Active Sites in BMA 8 (Long Passage) in 2016

There were four active sites in BMA 8 in 2016 growing Atlantic salmon.

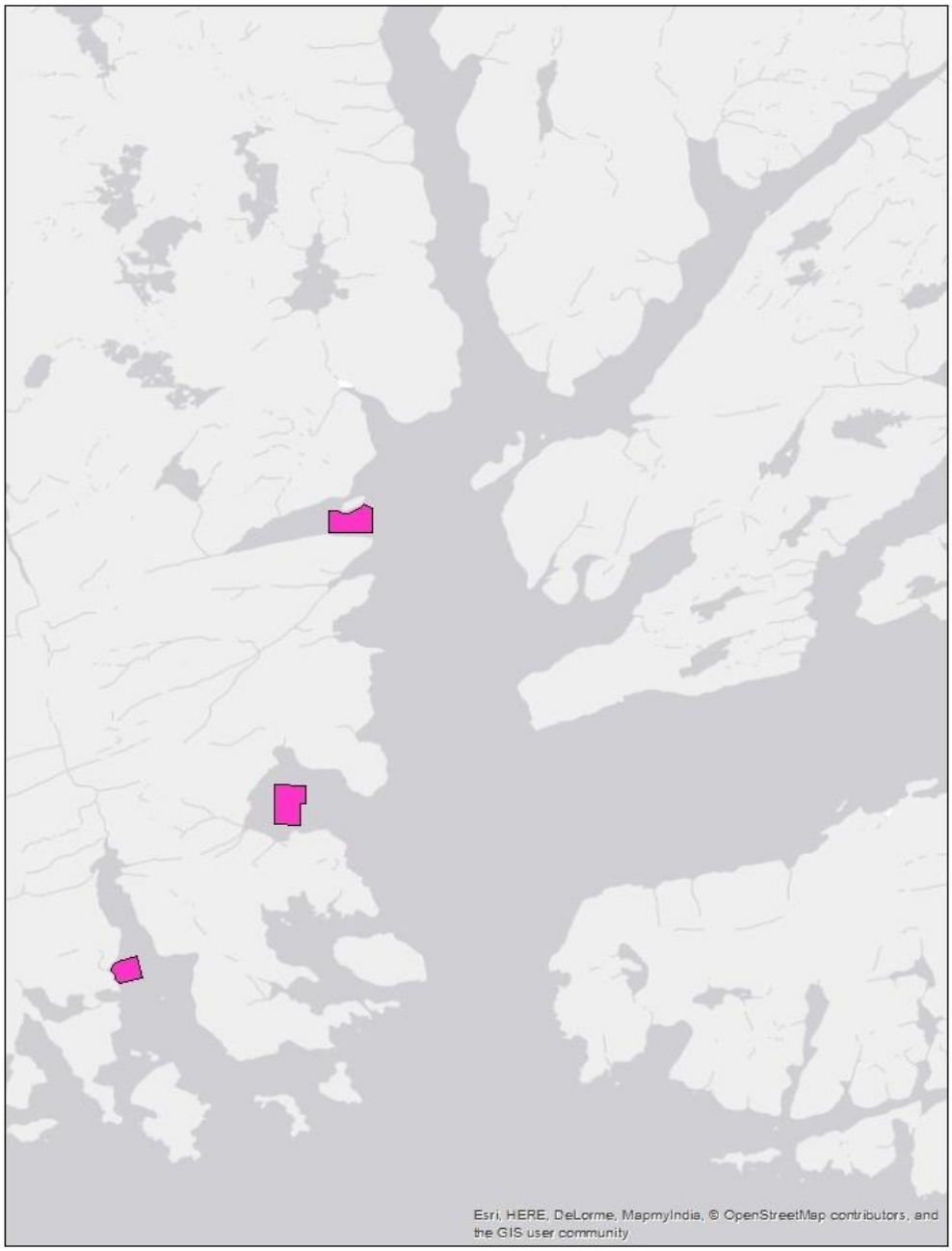
Figure 7: Active finfish sites from BMA 8 in 2016.



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

There were three active sites in BMA 9 in 2016 growing Atlantic Salmon.

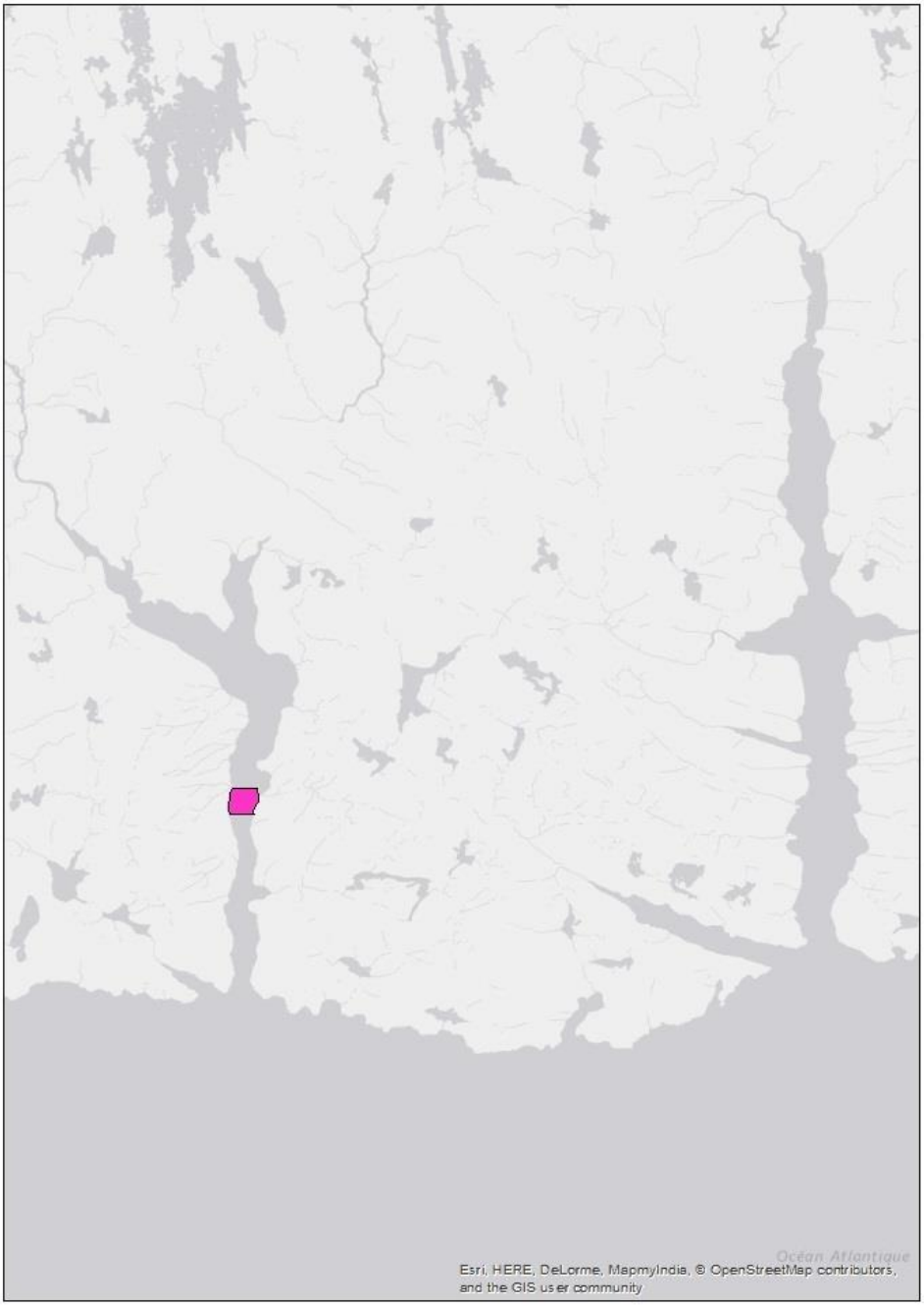
Figure 8: Active finfish sites from BMA 9 in 2016.



2.9 Number of Active Sites in BMA 11 (Hare Bay/Devil Bay/Rencontre West) in 2016

There was one active site in BMA 11 in 2016 growing Atlantic salmon.

Figure 9: Active finfish sites from BMA 11 in 2016.



3.0 APPENDIX 1 - EQUIPMENT STANDARDS:

A1.1 Nets and Net Testing

This section of the Code 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 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.

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. 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 2016. 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	453
Number of nets over 3 years of age	337
Number of nets under 3 years of age	102
Number of nets of unknown age*	14
Number of nets audited	242
Nets in use during spring inspection**	319
Nets in use during fall inspection**	255

*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 2016 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 2016. 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 2016.

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. 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 2016.

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 2016 will be submitted in January/February 2016).

Compliance:
There was full compliance for the year 2016. Industry wide, the 2016 Inventory Reconciliations tracked four-year classes of fish, starting with an inventory total of 11,452,165 salmonids and ended with 9,508,074 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). An 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	33111	2014	0	999	31425	0	-687		0
2	33780	2014	0	1457	34944	0	2621		0
3	36761	2014	0	1756	33574	0	-1431		0
4	35967	2014	0	416	34154	0	-1397		0
5	33900	2014	0	768	32685	0	-447		0
6	36361	2014	0	442	37954	0	2035		0
7	34199	2014	0	675	31599	0	-1925		0
8	35668	2014	0	610	34956	0	-102		0
9	35699	2014	0	271	37433	0	2005		0
10	33481	2014	0	425	33170	0	114		0
TOTAL	**348927**		**0**	**7819**	**341894**	**0**	**786**	**0**	**0**

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.

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 (eg. 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	30	319	23
Fall	24	255	22

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), DFLR 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 staff were available.

Compliance:

Spring – There were 23 incidents recorded:

- Five 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 questions to ensure this process was completed in a timely manner.

- Two incidents were nets that had not been checked by divers within the required 90-day period. FLR observed the sites in question until harvest was completed to limit the possibility of an escape. The incident was referred to FLR's enforcement and compliance division.
- Ten 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.
- One incident noted was a kinked cage collar. Again, follow-up inspections confirmed all repairs were completed.
- The remaining five 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.

Fall – There were 22 incidents recorded.

- Nine 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 questions to ensure this process was completed in a timely manner.
- Five 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.
- Three incidents noted were damaged cage collars. Again, follow-up inspections confirmed all repairs were completed.
- One incident was a net that had not been checked by divers within the required 90-day period. FLR observed the sites in question until harvest was completed to limit the possibility of an escape. The incident was referred to FLR's enforcement and compliance division.
- Two separate incidents on one site resulted in an Aquaculture License Suspension action being taken. A weekly Site Surface Inspection Checklist (Form A.4) was falsified and a hole low in the jump net was noted. The hole, in the opinion of the inspectors, could be the source of an escape. The site crew was informed of such and a request to repair the hole was issued. This action was not performed at that time and company head office was informed. The incident was referred to Enforcement and Compliance. On a follow-up inspection, it was noted the hole was not again repaired. After the issuance of the suspension of license on the third follow-up inspection visit, the hole was repaired.
- The remaining two 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.

The industry, aside from the incident resulting in the suspension identified above, 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:
As stated in section 6, there was one incident of drop nets not being employed during a lice count.

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 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

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 method. 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 were no reported escapes in 2016.

2015 escape reporting has been update to reflect new knowledge.

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.