

Tracking Salmon Kelts on the Miramichi River 2012
Final Report

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Introduction

Spring salmon, or “kelt”, is an Atlantic salmon (*Salmo salar*) that spawns in the previous fall, remains in the river over winter, and migrates towards the ocean in the spring to feed and recondition. Kelt survival on the Miramichi River has been estimated between 15-20% based on the life history characteristics of the fish captured in the DFO index trap nets. Kelt that do exit the river, recondition at sea, and return to the river for spawning are termed repeat spawners and these fish are important for juvenile production in the river system as they tend to be larger, produce larger eggs, and have more eggs than maiden salmon. It is also estimated that repeat spawning salmon produce between 25-40% of the salmon eggs laid in the Miramichi River each year. A kelt that leaves the river in spring, reconditions in the Gulf of St. Lawrence, and returns to spawn in the river in the same year is termed a consecutive spawner. A kelt that leaves the river in spring, reconditions in the gulf or Atlantic Ocean, and returns to spawn in the river the following year are termed alternate spawners. The ratio of repeat spawning salmon that come back as alternate spawners or consecutive spawners is roughly 1:1 depending on the year. Based on previous year’s results from this project, the largest loss of Atlantic salmon kelt appears to be at sea, although increased sample sizes will provide further insight into where the losses of some of these adults actually occurs.

The purpose of this project is to determine the migration paths and timing of kelt movements through the Miramichi River, Miramichi Bay, and Gulf of St. Lawrence. We will determine how long individual kelt spend in the ocean before returning to spawn as well as the locations and possible sources of mortality for kelt as they migrate to the ocean.

Methods

The most upstream Vemco VR2 receivers were deployed below the head-of-tide in the Northwest Miramichi River (Cassilis trap-net) and Southwest Miramichi River (Millerton trap-net) (Fig. 1). Other receivers were spread throughout the Northwest, Southwest, and main stem Miramichi Rivers (Fig. 1). The most downstream Miramichi River receiver

was located at river mouth in Loggieville (Fig. 1). Receivers were also located at the Miramichi Bay exits between the barrier islands near Neguac, Portage Island Channel, and Huckleberry Gully (Fig. 1). Receivers were deployed at the Gulf of St. Lawrence exits to the Atlantic Ocean in the Strait of Belle Isle between Newfoundland and Labrador and in the Cabot Strait between Newfoundland and Cape Breton. This is the second year that Cabot Strait had receivers and these were put in place through the Ocean Tracking Network.

Kelt were captured by angling on the Miramichi River near the Northwest Miramichi River head-of-tide. Fish were anesthetized using MS-222 in an oxygenated holding box. The fish was held upside down by another holding box with a wet sponge over the fishes' head to keep the gills moist. A transmitter was surgically inserted into the abdominal cavity by making a small incision in the abdominal wall and sliding the transmitter into the cavity. The incision was then closed with 2-3 sutures depending on the size of the incision taking between 1-3 minutes. After surgery the fish was placed in a wooden recovery box with river water flowing through it and after the fish had fully recovered it was released back into the river. The transmitters (acoustic tags) gave each fish an individual code and these codes were used to identify the fish when they passed by receivers. Each time a tag passed by one of the receivers, the receiver recorded the tag number, date, and time.

Results

Overall 35 kelt were angled and tagged over a two day period, April 20-21, 2012, on the Northwest Miramichi River at the Red Bank bridge (Table 1). The surgery typically took around two minutes and all fish recovered fully. A range of fish sizes were tagged with the smallest at 60.2 centimeters (cm) and the largest at 98.5cm (Table 1). Of the tagged kelt there was one male grilse, one male salmon, and 33 female salmon.

Kelt survival out of Miramichi River was very high as 94.3% of the tagged kelt were detected exiting the mouth of the river (Table 2). The two kelt that died within the river were last detected swimming by the Cassilis and Millstream receivers, just below the head-of-tide. A handheld acoustic receiver was used to actively search for the kelt

remaining in the river but neither tag was detected. Kelt survival through the inner Miramichi Bay barrier island receivers was also high as 88.6% of the tags were detected (Table 2). Kelt moved through Miramichi Bay between April 26 and May 18, 2012 (Fig. 2). Of the 31 kelt exiting the Miramichi Bay, two kelt went through the Neguac bay exit, 28 went through receivers at Portage Island Channel, and one kelt was detected at the Huckleberry Gully receivers.

After exiting Miramichi Bay, only five of the kelt were detected at the Strait of Belle Isle receivers, while none of the kelt passed through Cabot Strait receivers. Kelt that were detected on the Strait of Belle Isle receivers passed through the area between June 24 and July 3, 2012. All kelt that went through the Strait of Belle Isle were expected to be on their way to Greenland and will potentially return to the Miramichi River in 2013 as alternate spawners. Two kelt returned back to the Miramichi River to spawn in 2012 as consecutive spawners. Both kelt that returned to the Miramichi River returned to the Northwest Miramichi River branch where they had been tagged. Any kelt that exited the Miramichi Bay but were not detected by the receivers at the Strait of Belle Isle or Cabot Strait are either reconditioning the Gulf of Saint Lawrence or may have died at sea.

Our results over the past five years have shown that the kelt survival out of the Miramichi River and Miramichi Bay are high; however, survival to the Strait of Belle Isle and back into the river is variable indicating there may be environmental issues, predator concerns, or problems finding adequate prey after entering the marine environment. The proportion of kelt that pass through the Strait of Belle Isle traveling towards Greenland is highly variable, ranging from a high of 45.8% in 2008 to a low of 15.5% in 2010 (Cabot Strait not included because of incomplete receiver coverage between 2008-2011). A possible explanation for the low number of kelt passing through the Strait of Belle Isle in 2010 may be explained by the high number of kelt that returned as consecutive spawners that year. However, in 2012 there was a low proportion of salmon detected at the Strait of Belle Isle receivers (16.1%) and a very low proportion of the kelt returned to the river as consecutive spawners suggesting that either the kelt are reconditioning in the Gulf of St. Lawrence or have experienced a high rate of mortality in the gulf.

Table 1: Summary of the kelt collected and tagged at the Red Bank bridge in the Northwest Miramichi River on April 20-21, 2012. Acoustic and satellite tag identification numbers, fork length (cm), weight (kg), and sex are shown.

Date	Acoustic tag	Satellite tag	Fork length	Weight	Sex
20-Apr-12	15427		75.0	2.85	F
20-Apr-12	11108	117454	87.0	4.90	F
20-Apr-12	11109	117455	76.0	3.10	F
20-Apr-12	No tag		77.5	3.15	F
20-Apr-12	15428		77.9	3.10	F
20-Apr-12	11111	117457	92.3	6.05	F
20-Apr-12	15429		78.0	3.30	F
20-Apr-12	15430		79.5	3.05	F
20-Apr-12	No tag		74.2	2.90	F
20-Apr-12	15431		74.8	3.00	F
20-Apr-12	11112	117458	78.6	3.20	F
20-Apr-12	No tag		64.5	-	F
20-Apr-12	15432		98.5	6.90	F
20-Apr-12	11113	117459	80.3	3.80	F
20-Apr-12	15433		88.1	4.15	M
20-Apr-12	11114	117460	78.0	3.45	F
20-Apr-12	15434		75.3	3.10	F
20-Apr-12	11115	117461	75.5	2.65	F
20-Apr-12	11116	117462	76.0	3.05	F
20-Apr-12	11117	117463	78.6	3.50	F
20-Apr-12	15435		72.6	2.65	F
20-Apr-12	11110	117456	80.5	4.40	F
20-Apr-12	15436		80.5	4.00	F
20-Apr-12	15437		77.6	3.50	F
20-Apr-12	15438		79.4	3.70	F
20-Apr-12	15439		85.0	4.65	F
21-Apr-12	15440		82.9	4.10	F
21-Apr-12	15441		88.8	5.35	F
21-Apr-12	15442		77.5	3.50	F
21-Apr-12	15443		80.2	3.07	F
21-Apr-12	15444		97.4	7.00	F
21-Apr-12	15445		78.1	3.15	F
21-Apr-12	15446		91.0	5.65	F
21-Apr-12	15447		60.2	1.40	M
21-Apr-12	15448		67.1	2.45	F
21-Apr-12	15449		78.2	3.65	F
21-Apr-12	15450		79.2	4.00	F
21-Apr-12	15451		74.5	2.85	F

Table 2: Number of kelt surviving to the different receiver arrays by year. * denotes that an unknown number of alternate spawning kelt that will return in 2013.

Location	2008	2009	2010	2011	2012
Head of tide	50	50	50	50	35
River mouth	48	46	45	47	33
Miramichi Bay	48	46	45	47	31
Strait of Belle Isle	22	9	7	15	5
Returned to river as consecutive	3	4	9	5	2
Returned to river as alternate	4	0	5	2	*

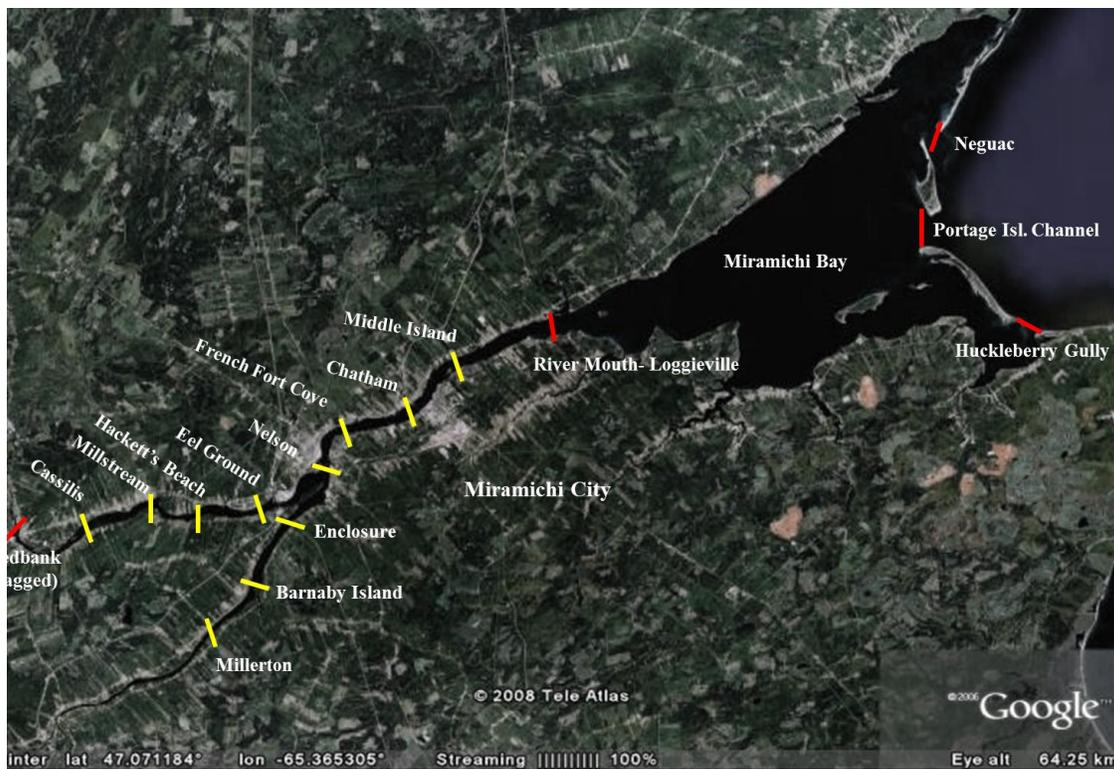


Figure 1: Map showing the receiver locations throughout the Miramichi River and the array of receivers in the Miramichi Bay exits at Neguac, Portage Island Channel, and Huckleberry Gully.

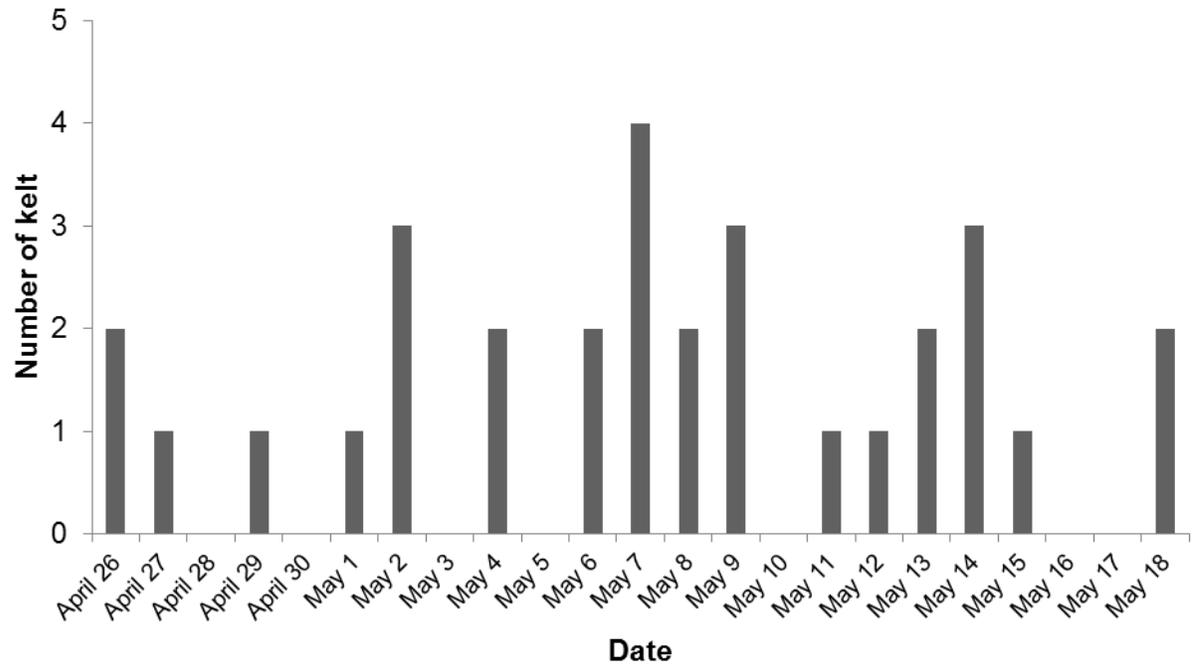


Figure 2: Timing of kelt movements through the receivers at the barrier islands of the inner Miramichi Bay, exiting to the Gulf of St. Lawrence.