

Smolt Production on the Miramichi River 2014

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Introduction

Declining Atlantic salmon runs in the Miramichi River during the 1970's and early 1980's marked the beginning of increased conservation efforts for this species. Action plans were put in place, including the closure of the commercial fishery and the mandatory release of all large salmon by anglers. From 1984 – 1992 the stocks rebounded and numbers were on the rise. After 1992 however, stocks began declining again and have continued to do so over the last two decades. Over recent years, the Southwest branch has outperformed the Northwest branch for adult returns. During the 15 years from 1998 – 2013, the Northwest system only reached conservation requirements (for sustainability) during two separate years, whereas the Southwest system met requirements for seven of those years. The average conservation requirement from 1998 – 2013 was 105% on the Southwest and 53% on the Northwest.

Electrofishing results from both the Northwest and Southwest branches of the river have typically shown healthy numbers of salmon fry and parr. It has been assumed that smolt production in these rivers would reflect these high juvenile numbers and therefore high smolt numbers should be produced, however adult returns do not reflect this trend. In 2011 angling regulations on the Northwest Miramichi were modified to a catch and release fishery to reduce human harvesting mortality on grilse. This policy has likely reduced the angling mortality rate on the Northwest system compared to the Southwest, but the large adults returning on the Northwest are still subjected to non-angling mortality from First Nations Fisheries Allocations. The Northwest River is also the site of a striped bass spawning ground where bass spawn at the same time as smolt are migrating to the ocean. This has the potential to increase smolt mortality rates through predation. Striped bass are also present in the Southwest branch but not concentrated in high numbers as at a spawning area like the Northwest branch.

Smolt population estimates have been carried out in recent years on each branch of the Miramichi River system separately. The MSA has conducted ten years of estimates on the Southwest branch and the last three years have focused on the Northwest branch. This year marks the first year of a new five year program that focuses on the river as a whole. The decision to change the program stemmed from concerns that over the last three years too many smolt were being missed in the Cassilis trap net because of washouts (the smolt

estimates would be artificially low in such cases). The net needed to be in a location where it could be fished continuously without being damaged or washed out. Tidal waters offer more security from spring freshets so a location in the estuary in Chatham was chosen as a new trap net location. Since this location would count smolts from both the Northwest and Southwest Branches, the tagging was expanded to include the Southwest and four smolt wheels in total were in place this year: two on the Northwest system and two on the Southwest.

The purpose of this study is to assess smolt production on the Miramichi River to determine if adequate juvenile production is occurring. An accurate estimation of the total smolt population migrating out of the Miramichi River system to the ocean is a key component to understanding and managing Atlantic salmon in this area. Ocean survival rates of smolt can then be observed in subsequent years as adults return as grilse and salmon and will help guide management decisions to conserve this important stock of salmon.

Methods

Study Area

The Miramichi River watershed drainage area is approximately 12,000 km². The system is divided into two large branches – the Northwest and the Southwest. The Southwest system encompasses 2/3's of the total drainage area, while the Northwest system is smaller – occupying 1/3 of the total area.

Design

The smolt production estimate for the Miramichi River used a two-sample mark-recapture study design. Four rotary screw traps (RST's) or smolt wheels were installed in early May. Two traps were located on the Northwest system – one on the Northwest River (operated by MSA) and one on the Sevogle (operated by NSPA), and two traps were located on the Southwest system – one on the Cains River (operated by MSA) and one on Rocky Brook (operated by IP). The original plan for 2014 was to have a smolt wheel at the mouth of the Dungarvon River on the Southwest system (not the Cains), but due to damage from late ice

flows field crews were unable to access this area and the Cains was chosen as a secondary location. The wheels are held in place by a large overhead cable that spans the width of the river. A second cable connects from this main line to the wheel, where two pontoons keep the wheel partially afloat and allow the trap to rotate fully (the current forces the wheel to turn) without hitting the bottom of the river.

Any fish entering the trap were funneled through the rotating wheel into a holding box at the back of the trap. The rotating wheel prevented any fish from escaping the box. All fish caught in the live box were collected and sorted. Each species was identified, counted, and released except for smolt. Fork lengths were taken on 25 smolt and scale samples were taken from 5 of these. The 20 smolt not scale sampled were tagged with small, individually numbered streamer tags. Any remaining unmeasured smolts were also tagged. All fish were released after tagging. For the purpose of this study all juvenile Atlantic salmon greater than 100mm (FL) were considered smolt.

A single large trap net was installed just upstream of the Centennial Bridge on the Chatham side of the Miramichi River to capture smolt leaving the estuary. Tagged smolt captured at the trap net allows us to get an estimate of the number of smolt moving out of the Miramichi River system. The total smolt run is determined by a ratio of the number of smolt tagged upstream at the smolt wheels, the number of tagged smolt that are recaptured in the trap net, and the number of untagged smolt captured in the trap net. The trap net was fished daily, generally at low tide, and the smolt were sorted from the rest of the species caught. Sub-samples of up to 100 smolt were measured, 20 of which were lethally sampled for length, weight, age, and sex information. All smolt captured were counted and checked for streamer tags.

Permits

The Navigable Waters Permit from the Department of Transportation, Instream Data Collection Devices Permit from the local Department of Environment and the Scientific Collection Permit from the Department of Fisheries and Oceans were all obtained prior to starting this project.

Results

The Northwest smolt wheel operated from May 13th – 19th, was raised on May 19th because of high water and reset on May 22nd. The wheel was operational again from May 23rd to May 26th. The smolt wheel on the Sevogle operated from May 12th to May 15th, was raised on May 15th because of high water, and reset on May 17th. The wheel was operational on May 18th and then lifted again on May 19th because of a heavy rain event and dangerous water levels. The wheel was reset on May 25th and operational from May 26th – 27th. The Cains smolt wheel was operational from May 17th – 26th. A total of 1444 smolt were tagged from the Northwest (273), Sevogle (293), and Cains (878) wheels. The peak of the smolt run for the Northwest was May 17th with 82 fish, the peak for the Sevogle was May 27th with 85 fish, and the peak for the Cains was May 20th with 211 fish.

The trap net operated from May 21st – 26th. High swells and poor weather conditions on May 27th kept crews from fishing the trap. The trap net held up against late spring ice and never had to be lifted, nor did it wash out.

From May 21st – 23rd the number of smolt caught in the trap net ranged from 89 to 1465. The number of smelt caught during the same timeframe ranged from 158 to 3070. On May 24th the net was so full of fish that estimates had to be made by dumping net scoops out. One scoop was sorted and counted for species and that number was applied to all other scoops removed. A 12 hour day resulted in a smolt estimate of 11,285 and a smelt estimate of 95,955. On May 25th it became apparent that the net had even more fish in it, and again estimates had to be made by dumping out net scoops and by lowering the net to allow the fish to escape without being scooped. Rough estimates for this day were 20,000 smolt and >400,000 smelt. At this point we knew a mark-recapture estimate for smolt this year had been compromised so we made an effort to try a new method to improve the project for next year. At the end of the day on May 25th, 4.5 meters of the leader (the section closest to the trap and farthest from shore) was lifted to try and reduce the catch numbers for the next day. On May 26th 598 smolt and 7,500 smelt were counted, a much more reasonable number of fish to handle in a day.

Mark-recapture analysis for this year was rendered impossible because we were unable to use a consistent recapture method. The smolt population estimate for 2014 is unknown. By

adjusting the leader in 2014 to decrease fish counts, we are confident the trap can be operated better for the 2015 field season.

Discussion

The Miramichi River needs upwards of two million smolt migrating to the ocean every year in order to sustain a healthy adult population – roughly 1.2 million from the Southwest branch and 600,000 from the Northwest. The standard estimate is 3.0 smolt/100m². The three years of data from the Northwest system have shown variable and sometimes conflicting results. In 2011 and 2013 smolt production exceeded 3.0 smolt/100m² and in 2012 was estimated at only 2.0 smolt/100m². Difficulties with equipment damage from weather and high water levels occurred during these years and may have impacted estimates. Earlier data from 2006 – 2010 on the Southwest system indicated that smolt production estimates exceeded requirements for all years except 2008. Even with these high smolt estimates the adult returns have continued to decline.

The 2014 field season suffered from a late spring and ice melt, as well high water levels that made for challenging field work operations. The wheels on the Northwest and Sevogle Rivers were lifted multiple times during high water, and most likely missed a large portion of the smolt run from these rivers, as smolt migrations have been shown to increase during high water events.

This was the first year for this new study of estimating smolt leaving the entire Miramichi River system. In most recent years the Northwest system had been the focus because of declining adult returns. The Chatham trap net was newly constructed this year. There was a delay in fabrication, along with extra time needed to alter the net, after delivery, to have it fit the pickets (wooden framework) at the site. The original plan was to have the net installed at most two days after the first smolt were tagged, but the first wheels were already installed when the delay was presented. The delay in trap net installation may have reduced our smolt catch numbers at the trap net, as there was an eight day period after the first smolt were tagged until the trap net was operational. The new trap net was larger than the trap net

used in previous years to recapture smolt. The length of the leader and the length and width of the net itself were more than double the previous year's trap. The efficiency of this trap net was unknown before using it and after fishing for roughly one week it became apparent that the net caught far too many fish for our field crews to handle on a daily basis.

Two-way mark-recapture calculations require consistent marking and recapturing techniques to produce an accurate estimate. With the large catch numbers at the trap net (which we were unable to count), the mark-recapture calculations for this year are impossible to determine.

The inability to determine an estimate this year does not allow for comparisons to be made to previous years. In the spring of 2015, a section of the leader on the trap net will be lifted for the entire duration of the smolt study in an effort to reduce catch numbers, and to provide a consistent recapture method to allow for more accurate smolt estimates.

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Promotion

The NBWTF was promoted through the Miramichi Smolt Production Study by use of pencils and stickers on the gear used at the smolt wheels. Through the MSA website under Programs, the NBWTF will be acknowledged, as well as in the report from this project to be circulated at the Miramichi Watershed Management Committee (MWMC) Science Committee meetings and at MSA board meetings in Freeport, ME and Boston, MA, as well as acknowledged at the joint MWMC/MSA Science Workshop.