

The Southwest Miramichi Smolt Study 2010

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By

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June 22, 2010

Introduction

Over the past three decades, there has been a continuing and recognizable need for conservation efforts to sustain Atlantic salmon stocks in the Miramichi River. Over that time, despite major management actions such as the closing of commercial fisheries in both the Maritimes and Newfoundland, annual returns have fallen below expectations. In very recent years, minimum spawning requirements for Atlantic salmon have just been met in the Miramichi River system.

An accurate estimation of the total smolt population migrating from the Miramichi River is an essential component to understanding and managing the Atlantic salmon in this watershed. Currently, work is being conducted to estimate the population of fry, 1+ and 2+ parr in the watershed using electrofishing; smolt wheels are used to estimate the number of smolts migrating from the Miramichi River; and trap nets are used to estimate an adult population. By having a population estimate for all of the different life stages it allows us to look at trends in the production of salmon between the various life stages and to pinpoint areas in the life cycle of Atlantic salmon where the most mortality is occurring.

Methods

The method used to obtain the smolt estimates was a mark and recapture experiment. On the Cains and Dungarvon Rivers, rotary screw traps (RST) or smolt wheels were used to capture smolts for tagging. The smolt wheel was strung across the river by an overhead cable and floated on the top of the water by two large pontoons. The current forced the partially submerged wheel to rotate. Any fish that entered the trap were guided into the trap's holding box which is located at the back of the smolt wheel. The rotating wheel prevented the fish from swimming out of the trap. All the fish in the live-box were collected and sorted. Each species caught was identified, counted and released, except for salmon smolts, which were measured for fork length and then tagged with streamer research tags. Scale samples were also taken from up to five smolts per day for age analysis. After the smolts were tagged they were moved upstream of the smolt wheel. The percent of tagged smolts that are recaptured at the smolt wheel allow us to estimate the number of smolts moving out of that particular tributary.

A single large trapnet was installed in the estuary of the Southwest Miramichi at Millerton to capture smolts moving from freshwater into the estuary. Tagged smolts captured at the Millerton trap net allow us to get an estimate of the smolts moving out of the entire Southwest Miramichi. The Millerton trapnet efficiency is calculated by the total catch of smolts at Millerton divided by the population estimate. The total smolt run from the Southwest Miramichi is determined by a ratio of the number smolts that are tagged upstream at the Cains, Dungarvon and Rocky Brook smolt wheels, the number of tagged smolts that are recaptured at the Millerton trap and the number of untagged smolts captured at the Millerton trap. This latter facility was fished daily, generally at low tide, and the smolts were sorted from the rest of the species captured. Each day, sub-samples of up to 100 smolts were measured and 20 were sampled in detail for length, weight, sex

and age. All smolts captured were counted and checked for missing adipose fin clips and streamer tags.

Results

The Cains smolt wheel operated from April 25 to May 27 and Dungarvon smolt wheel operated from April 25 to May 27, 2010, because of early ice out within the tributaries and warmer than normal water temperatures early in the season. The estuary trap net at Millerton fished much earlier than previous years, from May 3 to May 30, 2010, due to early ice out and warm spring temperatures.

The peak of the smolt run for the Cains River was May 4 and 87 smolts were captured. The peak of the smolt run on the Dungarvon River was May 7 with 153 smolts being captured that day. The peak of the smolt run in 2010 was more than a week earlier than 2009, likely due to the warm spring air temperatures and low snow accumulation over the winter that facilitated the warming of the rivers and movement of smolts. This year we tagged 635 smolts on the Cains and 1569 smolts on the Dungarvon River and were able to capture approximately 749 smolts in the Cains smolt wheel and 1722 smolts on the Dungarvon smolt wheel over the entire season, which was less than in 2009. This was likely due to reduced efficiency of the smolt wheels due to the low water conditions, as both the Cains and Dungarvon smolt wheels had lower capture efficiencies than in previous years.

The smolt estimate for the Dungarvon River in 2010 was 71,000 (CI 54,000 to 103,000), which worked out to be 3.2 smolts per 100m², exceeding the target of 3.0 smolts per 100m². There was no smolt estimate for 2010 on the Cains River due to the low number of recaptures (n=4) due to the low efficiency of the smolt wheel. The efficiency of the smolt wheel on the Cains River is typically between 1-2%, however due to the extremely low water conditions experienced in 2010 the trap efficiency was 0.6%. The water conditions were so low in 2010 that the Cains smolt wheel hit bottom from the first day it was put in, and each day had to be raised a bit higher to prevent it from hitting the river bottom more. With low discharges the smolt wheels do not rotate quickly and it may be that some fish were able to swim out of the wheel.

At the Millerton trap, we captured 65,785 smolts, 158,000 smelts, 1000 striped bass and 500 gaspereau as well as many other species throughout the season. In 2010 we processed the most number of fish through the trap as in any of the other years, and had double the amount of smolts in the trap compared with the highest number of the previous 9 years. We were able to recapture 82 smolts with streamer tags at the Millerton trap net which were tagged at the Cains, Dungarvon or Rocky Brook smolt wheels upstream. Smolt production on the Southwest Miramichi in 2010 was estimated at 2.18 millions smolts (6.2 smolts per 100m²). This is the highest smolt production for the Southwest Miramichi on record. The Southwest Miramichi greatly exceeded the desired smolt production in 2010 of 3.0 smolts per 100m², which it has in 5 of the last 6 years (not including 2005 in which there was no estimate as the trap was washed out). In addition, 0.2% of the Southwest Miramichi smolt run was comprised of salmon smolts with clipped adipose fins which were stocked by MSA a few years earlier.

Overall smolt production on the Dungarvon and Southwest Miramichi was good in 2010 with all rivers exceeding their production targets. It is likely that the Cains River had higher production than average, as the Dungarvon, Southwest Miramichi and Rocky

Brook had higher smolt production than usual. Additionally the Dungarvon also experienced reduced efficiency like the Cains, likely due to lower water levels, however adequate numbers of fish were able to be recaptured on the Dungarvon.

Discussion

Smolt production on the Southwest Miramichi and its tributaries may have been higher than previous years due to a relatively mild winter and early spring. The ice on the river this winter was not as thick as usual, and there was a minimal spring freshet during ice out due to low snowfall this winter. This may have translated to smolts experiencing less harsh conditions during the spring ice out, such as fewer ice jams and reduced discharges ect. Therefore smolt survival through the spring may have been higher than in previous years, hence the higher smolt production observed this spring compared to previous years.

The data collected from this project over the past nine years has indicated that over the past five out of six years smolt production of 3.0 smolts per 100m² from the Southwest Miramichi has been achieved or very close to being achieved. This indicates that the Southwest Miramichi River should be producing enough smolts to allow adequate numbers of adults to return. However on the Cains River smolt production over the past nine years is typically around 1-2 smolts per 100m², which indicates that the Cains River has relatively low smolt production relative to other rivers on the Miramichi River. The Dungarvon River tends to have moderate smolt production with typically between 2-3 smolts per 100m². These trends indicate that not all tributaries produce the same number of smolts and that while some tributaries produce large numbers of smolts, (ie. greater than 3 smolts per 100m²), other tributaries fall below that target.

In addition to determining differences in smolt production between the different tributaries this project has also given insight into the factors why adult returns have been lower than expected. Over the past twenty years the at sea return rates for smolt returning as grilse or two sea-winter maiden salmon has decreased, and reached a record low at sea survival in 2009 as grilse returns were the lowest seen since the 70's despite good smolt production from the Southwest Miramichi in 2008.

The data collected from this project will be published in the Canadian Technical Report of Fisheries and Aquatic Sciences as part of two publications documenting the movements and population characteristics of Atlantic salmon smolts from two Southwest Miramichi River tributaries (Cains and Dungarvon) and the Southwest Miramichi River (attached). Data from this project is also being used to assess the survival of salmon parr (1-2+) to the smolt stage by comparing electrofishing densities the previous year and to assess the survival to the grilse and two sea-winter maiden salmon stage by comparing smolt estimates to the returns of grilse and salmon the following years.

Acknowledgements

The Miramichi Salmon Association acknowledges the financial contributions of the New Brunswick Wildlife Trust Fund, Canada Summer Jobs (CSJ), the Student Employment Experience Development (SEED), MSA members, and in kind-help provided by the Department of Fisheries and Oceans for this project in 2010.