Smolt Production on the Northwest Miramichi River

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Introduction

Over the past three decades there has been a continuing need for conservation efforts to sustain Atlantic salmon stocks in the Miramichi River. While the adult stock assessment has indicated that Southwest Miramichi has averaged 103% (range 77% to 119%) of the conservation requirement (for sustainability) in the years 1998 – 2009, the Northwest Miramichi typically reaches less than 50% (range 26% to 111%) of spawning escapement in a given year.

Although electrofishing studies on the Northwest Miramichi have consistently indicated an abundance of fry and parr in the river, the adult returns have been much lower than should logically be expected. It has been assumed that smolt production would be consistent with the levels of juveniles; however, adult returns to the Northwest Miramichi do not seem to reflect this trend. Hence, an accurate estimation of the total smolt population migrating from the Northwest Miramichi River and its tributaries is an essential component to understanding and managing Atlantic salmon in this watershed and a way to measure at-sea survival of smolt returning as grilse and salmon. This information will also allow us to determine which tributaries contribute the most to smolt production on the Northwest Miramichi since the juvenile densities (fry and parr) vary between tributaries, with the Little Southwest being the lowest, Big Sevogle moderate and Northwest Miramichi being highest.

The Northwest Miramichi system likely experiences an increased harvest compared to the Southwest Miramichi of grilse and salmon due to the abundance of public pools, crown reserve stretches and First Nation Fisheries Allocations which could reduce the number of salmon available for spawning each year. Additionally the Northwest Miramichi has an increasing striped bass population which contributes to increased mortality of smolt exiting this system on their way to the ocean.

The smolt population estimates from this study represent the second year of the multi-year Northwest Miramichi River smolt production project. The purpose of this project is to assess smolt production on the Northwest Miramichi system, and its three major tributaries; the Big Sevogle River, the Northwest Miramichi tributary and the Little Southwest Miramichi (smolt estimate conducted by the Northumberland Salmon Protection Association (NSPA)) to determine if adequate juvenile production is occurring in the Northwest Miramichi River System. The data

will be used to allow science based management decisions to be made for the Northwest Miramichi system since the conservation targets of adult salmon have rarely been met. Finally, to determine the at sea-survival from smolt to adult salmon on the Northwest, since it may be higher due to predation by striped bass, as smolt move through the primary spawning area for striped bass in the Gulf of St. Lawrence.

Methods

The method used to obtain the smolt estimates was a mark and recapture experiment. On the Sevogle, Northwest and Little Southwest Rivers, rotary screw traps (RST), or "smolt wheels," were used to capture smolt 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 smolt, which were measured for fork length and then tagged with streamer research tags. Scale samples were also taken from up to five smolt per day for age analysis. After the smolt were tagged they were moved upstream of the smolt wheel. The percent of tagged smolt that are recaptured at the smolt wheel allow us to estimate the number of smolt moving out of that particular tributary.

A single large trapnet was installed in the estuary of the Northwest Miramichi at Cassilis to capture smolt moving from freshwater into the estuary. Tagged smolt captured at the Cassilis trap net allow us to get an estimate of the smolt moving out of the entire Northwest Miramichi. The Cassilis trapnet efficiency is calculated by the total catch of smolt at Cassilis divided by the population estimate. The total smolt run from the Northwest Miramichi is determined by a ratio of the number smolt that are tagged upstream at the Sevogle, Northwest and Little Southwest smolt wheels, the number of tagged smolt that are recaptured at the Cassilis trap, and the number of untagged smolt captured at the Cassilis trap. This latter facility was fished daily, generally at low tide, and the smolt were sorted from the rest of the species captured. Each day, sub-samples

of up to 100 smolt were measured and 20 were sampled in detail for length, weight, sex and age. All smolt captured were counted and checked for missing adipose fin clips and 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 Sevogle smolt wheel operated from May 1 to May 26, the Little Southwest smolt wheel operated from May 1 to May 25, and the Northwest Miramichi smolt wheel operated from May 1 to May 26 although the Northwest smolt wheel was not operational on May 11. The estuary trap net at Cassilis operated from May 8 to May 31 but the trapnet leader was washed out on May 12 due to high water conditions and did not operate again until May 16.

The peak of the smolt run for the Sevogle River was on May 11 with 1026 smolt. The peak of the smolt run on the Northwest River was on May 12 with 195 smolt. The peak of the smolt run on the Little Southwest River was on May 11, 2012 with 117 smolt. In 2012, we tagged a total of 1212 smolt on the Sevogle, 818 smolt on the Northwest Miramichi, and 667 smolt on the Little Southwest Miramichi. We were able to capture 1747 smolt in the Sevogle smolt wheel, 949 smolt in the Northwest River smolt wheel, and 847 smolt in the Little Southwest smolt wheel over the entire season. The capture efficiency of the Sevogle smolt wheel was 1.65%, the Northwest Miramichi smolt wheel was 5.75%, and the Little Southwest smolt wheel was 1.47%.

The smolt estimate for the Sevogle River in 2012 was 104,500 (95% CI 73,000 to 174,500), which worked out to be 3.6 smolt per $100m^2$ (Fig. 1). The smolt estimate for the Northwest Miramichi River in 2012 was 15,700 (95% CI 12,300 to 21,400), which worked out to be 0.4 smolt per $100m^2$ (Fig. 1). The smolt estimate for the Little Southwest River in 2012 was 56,000 (95% CI 35,000 to 129,000), which worked out to be 0.7 smolt per $100m^2$ (Fig. 1). Therefore according to our smolt estimates the only tributary of the Northwest Miramichi River that met the target of 3.0 smolt per $100m^2$ was the Big Sevogle River.

At the Cassilis estuary trap, we captured 6392 smolt and we were able to recapture 47 smolt with streamer tags at the Cassilis trap net which were tagged at the upstream Sevogle, Northwest or Little Southwest smolt wheels. Smolt production on the entire Northwest Miramichi River system in 2012 was estimated at 328,000 smolt (95% CI 255,000 to 452,000) (Fig. 1), which worked to 2.0 smolt per $100m^2$ assuming a 10% mortality of tagged smolt due to handling and predation.

Discussion

The Northwest Miramichi River had the lowest estimated smolt production despite this tributary generally producing adequate fry and parr density. One potential reason that smolt estimate may be low in this tributary is that the smolt wheel was not operational on May 11, which was the peak smolt movement date for the other two tributaries. Furthermore, May 12 was determined as the peak smolt movement day for the Northwest Miramichi River, so it is possible that May 11 may have also provided a high number of migrating smolt.

Our objective to reach the 3.0 smolt per $100m^2$ smolt production target for the Miramichi was not exceeded on the Northwest Miramichi River system, as had been done in 2011. However, in 2012 the Cassilis trapnet was washed-out and was therefore not operational from May 12 to May 15. The Cassilis trapnet wash-out occurred a day after the peak smolt run in both the Sevogle and Little Southwest Rivers (May 11 for each tributary), as well as the peak smolt run of the Northwest Miramichi River (May 12); therefore, this likely had a large impact on the smolt production estimates for the Northwest Miramichi River system.

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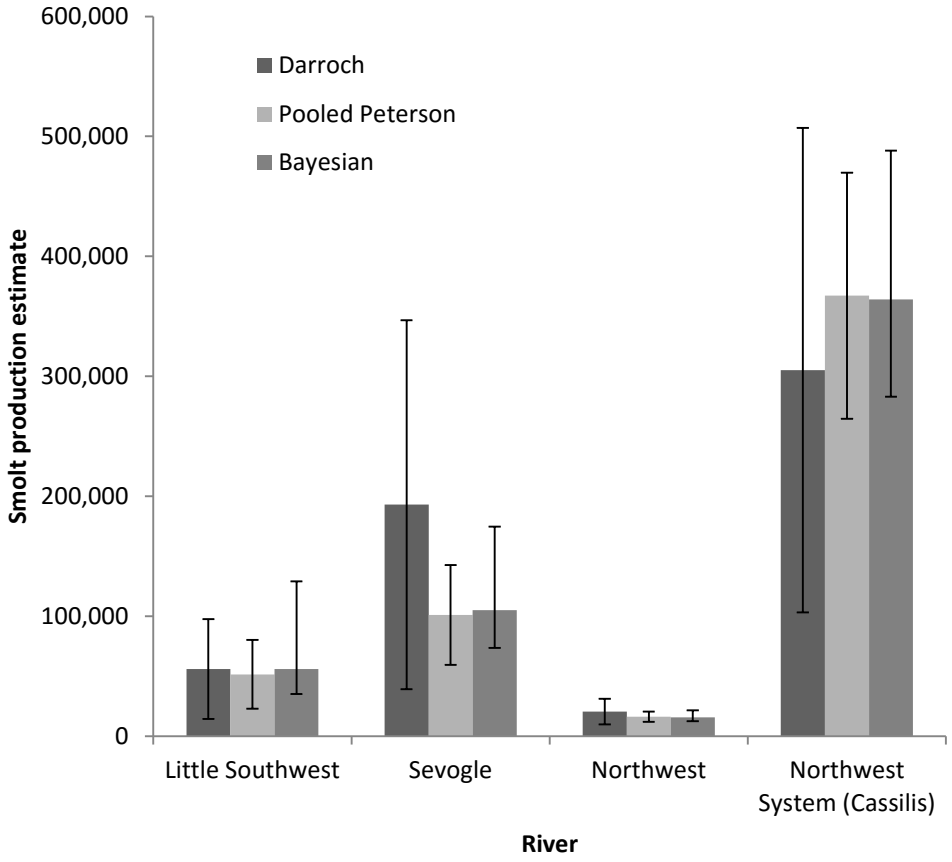

Figure 1: Smolt production for the major rivers on the Northwest Miramichi in 2012 using three different population estimation models; Darroch, Pooled Peterson, and Bayesian.

Promotion

The New Brunswick Wildlife Trust Fund was promoted through the Northwest Smolt Production Study by the use of the pencils and stickers, on the gear used at the smolt wheels, as well the logo was on the overhanging cable signs above the smolt wheels. Through the MSA website under Programs, the NB WTF will be acknowledged, as well as in the report from this project to be circulated at the Miramichi Watershed Management Committee Science Committee meetings and at MSA board meetings in Boston, MA and Freeport, ME as well as acknowledged at the joint MWMC/MSA Science Workshop.