Striped Bass Egg and Larval Survey 2018

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January 7th, 2018

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Executive Summary

The abundance of striped bass (*Morone saxatilis*) in the Southern Gulf of Saint Lawrence has increased significantly since the early 2000s, with the most recent estimate of spawner abundance (2017) being 994,000 fish. The Northwest Miramichi estuary remains the only confirmed spawning location for this population; however, there had been no effort to sample in other estuaries that may be contributing to the increase in population size. Because of this fact, the COSEWIC status for the Southern Gulf of Saint Lawrence population is still listed as "Special Concern". Ichthyoplankton surveys were conducted by The Miramichi Salmon Association on the Northwest Miramichi River, the Southwest Miramichi River, and the Tabusintac River in order to observe the presence or absence of Striped bass eggs and larvae. The presence of both eggs and larvae was discovered in the Northwest Miramichi River as well as the Southwest Miramichi river which contradicts the main threat of the COSEWIC status of "special concern". The Tabusintac river had an absence of eggs/larvae; however, it is believed that the surveys were conducted at inopportune times. It is recommended that this study be continued into 2019, and includes historic striped bass spawning locations in the future.

Introduction

The striped bass (Morone saxatilis) is a native, large-bodied anadromous fish species which overwinters in estuaries or coastal areas and spawns in many of the freshwater/ brackish water estuaries of the Atlantic coast of North America ranging from the St. Lawrence River to the St. Johns River in northeastern Florida (COSEWIC, 2012). The Southern Gulf of St. Lawrence population of striped bass ranges from eastern Quebec to Nova Scotia and out into the Atlantic Ocean as far as Prince Edward Island. It is known as a single population with a distinct genetic makeup that is isolated from other striped bass populations in Atlantic Canada and the Eastern United States (Chaput, 1995).

Striped bass were once a very sought-after recreational fish species in the Maritimes, but due to overharvesting, the abundance of striped bass returning to the spawning grounds of Northwest Miramichi dropped to very low levels in the mid-1990s (Robichaud-Leblanc et. al,

1996). Because of this, management efforts were enacted first with the closure of the commercial fishery (1996), the recreational fishery (2000), and the suspension of First Nations fishing for food, social, and ceremonial purposes (2000) (DFO, 2013). In 2004, the conservation status for striped bass in the southern Gulf was labeled as "threatened" because of its extremely low numbers and single known spawning location (COSEWIC, 2004).

Some researchers believed that striped bass historically spawned in the Nepisiguit, Tabusintac, Miramichi, Kouchibouguac, Richibucto, and St. Lawrence rivers (Rulifson and Dadswell 1995). They are not documented to be successfully spawning there now. The only known location of successful spawning for the entire Southern Gulf of St. Lawrence population occurs between May and June in the upper portion of the tidally influenced water of the Northwest Miramichi River (Douglas et al., 2009). Because of this fact, the COSEWIC status for the Southern Gulf of Saint Lawrence population is still listed as "Special Concern", with the last assessment being in 2012 (COSEWIC, 2012).

The abundance of striped bass (Morone saxatilis) in the Southern Gulf of Saint Lawrence has increased significantly since the early 2000s (re-opening the recreational and aboriginal fishery in 2013) with the most recent estimate of spawner abundance being 994,000 fish in 2017, achieving its recovery limit (DFO, 2018). Even with this increase in abundance, The Northwest Miramichi estuary remains the only confirmed spawning location for this population and it remains listed as a population of "special concern"; However, there has been no effort to sample in other estuaries that may be contributing to the increase in population size.

The objective of the Miramichi Salmon Association was to sample three rivers in the Southern Gulf for the presence of striped bass eggs and larvae.

Methods

Study Area

The Northwest Miramichi (NW) watershed drainage area of 3,950km2 makes up approximately one third of the total watershed of the Miramichi River. The Northwest Miramichi basin includes two major river systems: The Little Southwest River and the Northwest Miramichi

River, which merge in a delta at the head of tide. The Northwest Miramichi River includes a large tributary, the Sevogle River.

The Southwest Miramichi (SW) watershed drainage area of 7700km2 makes up the remaining two-thirds of the total watershed of the Miramichi River. The Southwest Miramichi basin includes many smaller river systems, such as the Renous River, the Dungarvon River, the Cains River, and Rocky Brook.

The Tabusintac watershed has a drainage area of 717km2 which includes all of the lakes and streams that drain into the Tabusintac bay (Herrell and Methven, 2009). The mouth of the bay is protected from the Gulf of Saint Lawrence by an ever-shifting dune system and is located north of the Miramichi river in the Acadian peninsula in Northeastern New Brunswick.

Sampling

Ichthyoplankton sampling took place from June 13th ,2018 to June 20th, 2018 for Striped bass eggs and larvae on 3 river systems: 2 study sites on the Northwest Miramichi River (Figure 1) which served as the control, 4 sites on the Southwest Miramichi River (Figure 2), and 5 sites on the Tabusintac River (Figure 3). After spawning behaviour had been identified in the various rivers, Miramichi Salmon Association (MSA) staff went out in a small outboard motor boat to sample locations downstream of suspected/ known spawning sites, where eggs and larvae were suspected to have drifted. At each site, locations were marked with a hand-held Garmin etrex 20 GPS unit and the vessel anchored. Water temperature and dissolved oxygen readings were taken with a YSI dissolved oxygen meter. Secchi depths were taken at the substrate and at the point of reappearance on the shadowy side of the boat, in order to estimate the maximum sampling depth. This was to ensure that the plankton net used would remain at a depth where it would not hit bottom and collect sediment.

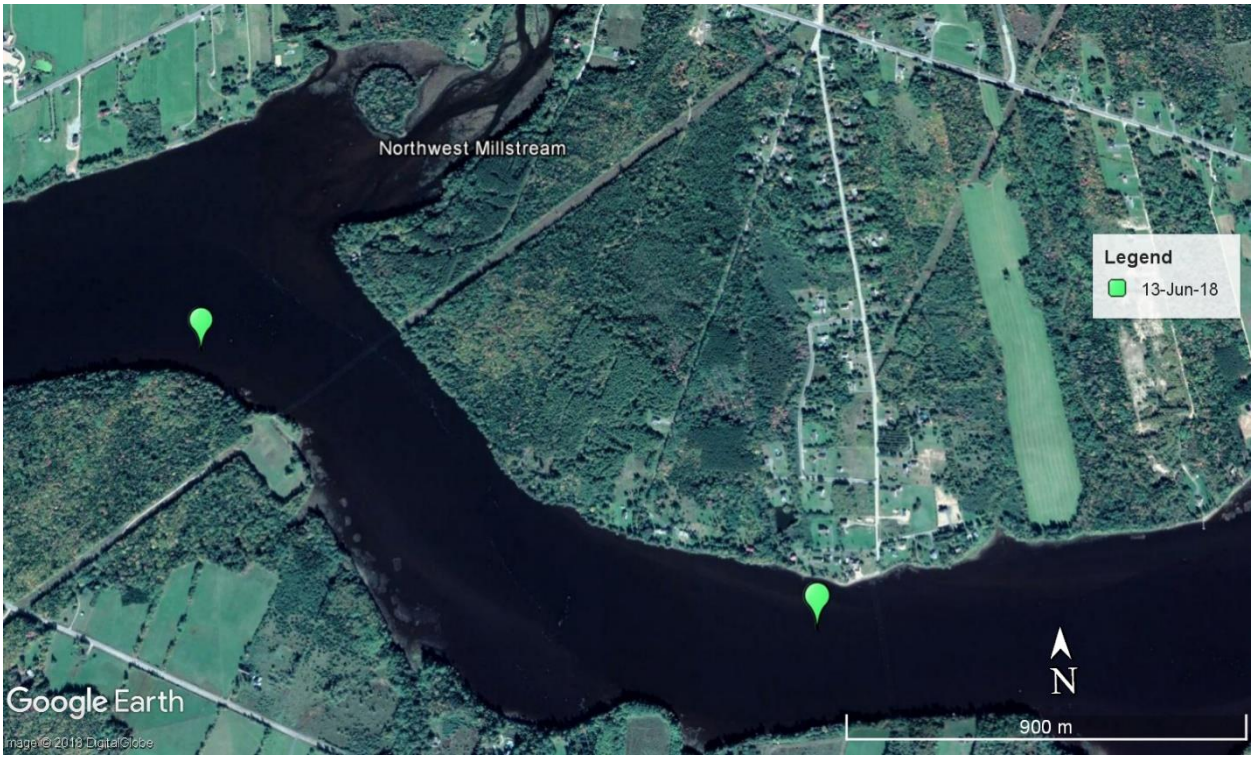

Figure 1. Ichthyoplankton sampling locations ([46.957454°, -65.686032°] and [46.963738°, -65.705295°]) on the Northwest Miramichi River on June 13th, 2018.

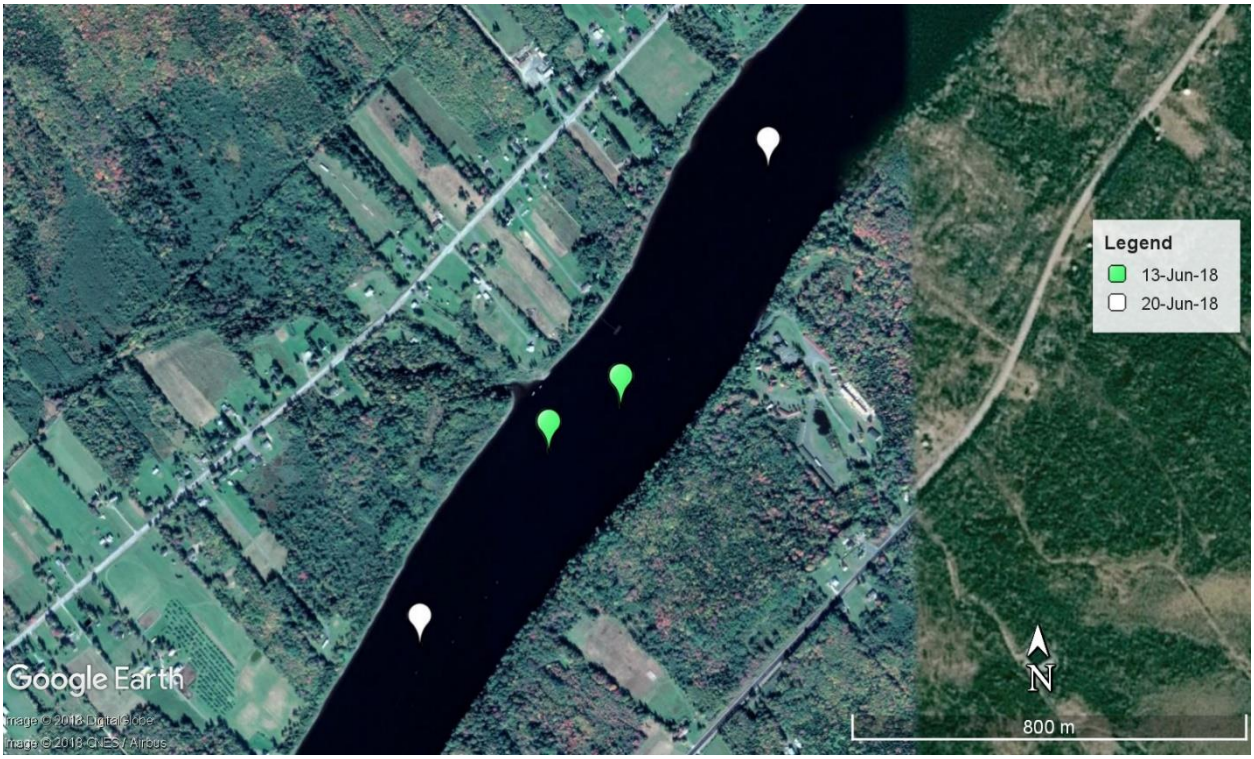

Figure 2. Ichthyoplankton sampling locations on the Southwest Miramichi River on June 13th, 2018 ([46.876166°, -65.663802°], and [46.875337°, -65.665718°]) and June 20th, 2018 ([46.871829°, -65.669179°], and [46.880460°, -65.659881°]).

Figure 3. Ichthyoplankton sampling locations on the Tabusintac River on June 15th, 2018 ([47.337600°, -65.118200°], and [47.339300°, -65.100900°]) and June 19th, 2018 ([47.334489°, -65.129869°], [47.343792°, -65.088103°], and [47.349587°, -65.078656°]).

A plankton net with a mesh size of 500 microns was used to sift water for striped bass eggs and larvae. The net was disinfected and washed down before every use and a flow meter reading taken. The net was then towed in the water column by the boat very slowly in a zig-zag formation for approximately 2 minutes. The contents of the net were washed down into the "cod end" and then transferred to a sample bottle. The flow meter reading was taken again and the sample bottle labeled with the location, sample number, date, and trawl time of collection. The bottles were then sealed and placed in a cooler to protect them from light and to be kept as cool as possible, until they could be examined in the lab at a later time on the day they were sampled.

Identification

The sorting of plankton samples and checking for striped bass eggs and larvae was done with the use of a dissecting microscope. Larvae from the NW samples were identified using the Electric Power Research Institute (EPRI) larval fish and egg key (EPRI, 2017), and then verified by

DFO personnel in order to be sure of the species. The collections from the SW and Tabusintac rivers were also observed under the dissection microscope and compared to the NW for confirmation of species. Small samples of the Striped bass eggs and larvae were preserved in vials of 60% ethanol solution to be used for reference in future identifications.

Results

Sampling

The collections took place below the head of tide (in the tidal fresh water) in each the NW and SW Miramichi rivers, as well as the Tabusintac river. Both Trawls from the Northwest river took place on June 13th, 2018 and covered approximately 1 km of river per collection over a two-minute time period. Water temperatures were 15.5°C at the upriver (UR) site, and 15.8 °C at the downriver (DR) site with average water depths at 8.2m and 5m respectively.

The Southwest river trawls took place on June 13th, 2018 and again on June 20th, 2018. On June 13th each trawl covered approximately 1 km over a two-minute time period (water temperature averaging 16.4 °C, water depth 3.6m UR and 3m DR), however on June 20th each two-minute trawl covered only approximately 600m at the upriver site and 400m at the downriver site due to high winds. The water temperature was averaging at 18.1°C (which was the warmest sampling day) and the average water depth was 3m and 5m respectively.

The Tabusintac river proved to be to be a more difficult spot to sample due to the fact that the winds were high on our sample days and the river wide and relatively shallow. Two trawls were conducted on June 15th, 2018 that each covered approximately 1 km over a two-minute time period (water temperature averaging 15.5 °C, water depth 4m UR and 5.2m DR). On June 19th, 2018 three trawls were conducted in order to sample a wider range on the Tabusintac. The upriver and downriver trawls covered approximately 1 km over a two-minute time period, however the midriver (MD) trawl only covered 550m over two minutes due to high winds. Water temperatures averaged 16.5 °C and water depths were 4.3m at the UR site, 3.4m at the MR site, and 5m at the DR site.

Identification

Because the objective of this project was to identify the presence or absence of striped bass eggs and larvae, samples were observed and species identified but not counted. The NW samples were the first to be looked at since this was the control river and it is already known that Striped bass historically spawn successfully there. When the samples were collected on the river, larvae were so plentiful that you could see them with the naked eye (Figure 4). Under the dissection microscope, both eggs and larvae were identified using illustrations and descriptions from the EPRI larval fish and egg key, and confirmed by DFO scientist Scott Douglas (Figure 5). There were many examples of both eggs and larvae on the NW Miramichi river which were used to compare the samples from the other rivers to.

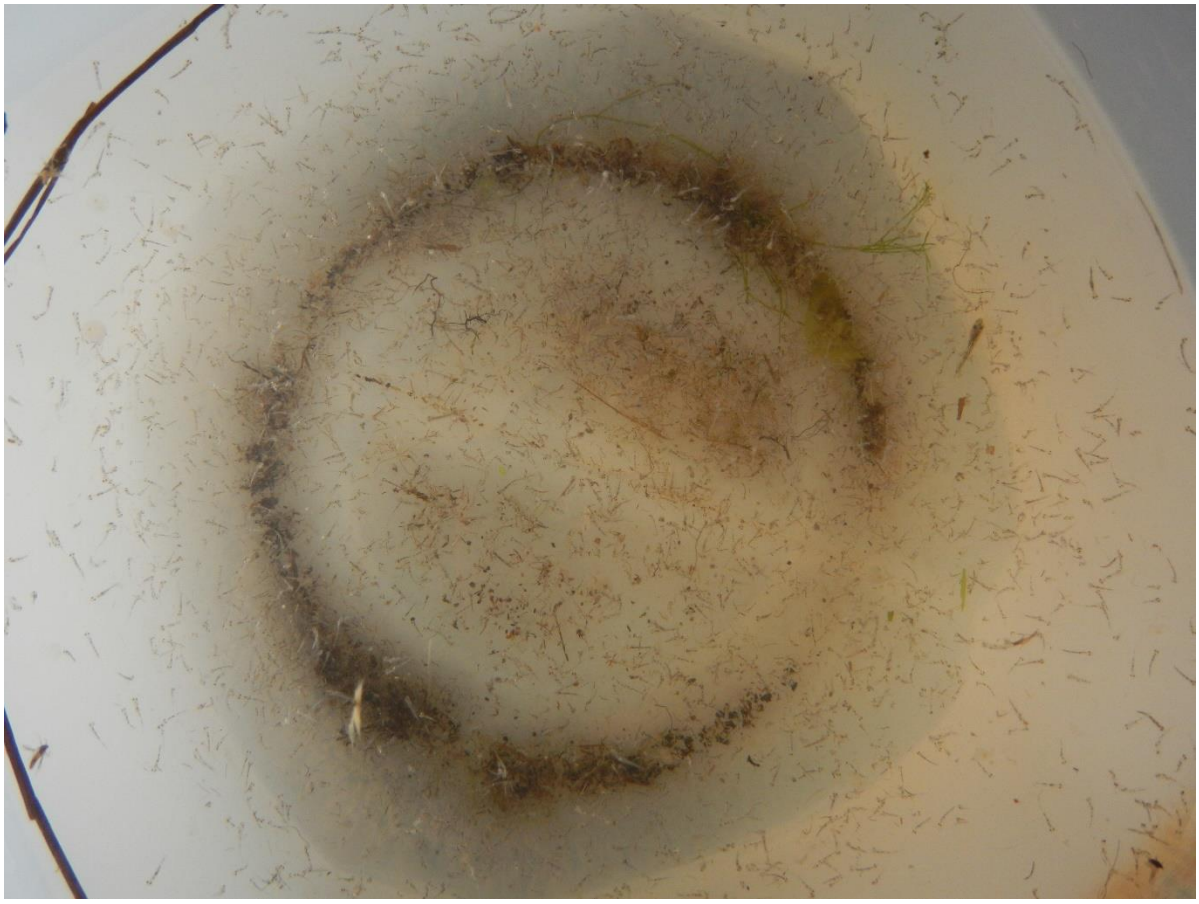

Figure 4. Striped bass larvae immediately after being collected on the Northwest Miramichi River on June 13th, 2018.

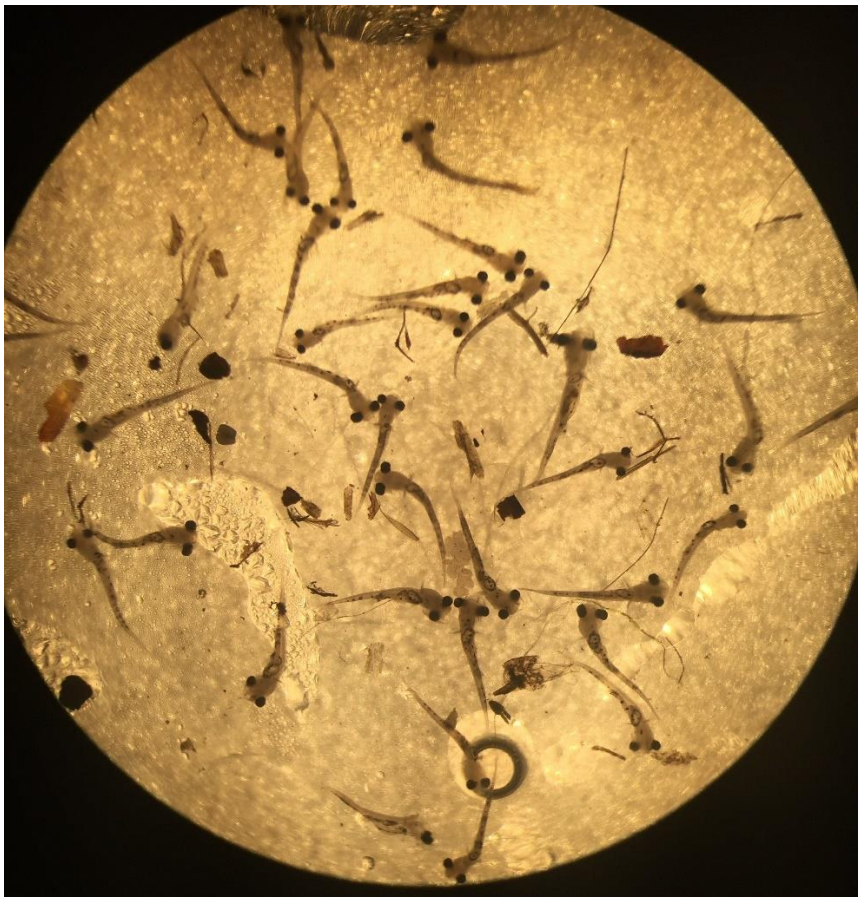

Figure 5. Striped bass larvae from the Northwest Miramichi River viewed under a dissection microscope.

The samples collected on June 13th on the SW Miramichi river were also examined by Scott Douglas, and Striped bass eggs and larvae were confirmed in both the upriver and downriver samples (Figure 6). The samples collected on June 20th also had both eggs and larvae present; however, they were less abundant.

No examples of striped bass eggs and larvae were detected in any of the samples taken from the Tabusintac river on both dates of collection.

Figure 6. An example of a striped bass egg and larva side by side viewed under a dissection microscope

Discussion

The Striped bass egg and larval collections took place approximately 1 week after it was observed that spawning activity had started to subside in the Northwest and Southwest Miramichi rivers. Spawning was observed on the Tabusintac river much earlier than on the NW and SW; however, sampling could not take place due to the lack of L52 scientific license at the time. There was an abundance of Striped bass eggs and larvae examined in the NW river samples. Seeing as it is listed as the singular spawning location for the Southern gulf of St. Lawrence striped bass population (COSEWIC, 2012), this was expected.

Of the four samples that were analyzed from the Southwest Miramichi River, those that were collected on June 13th, 2018 had shown a greater density of eggs and larvae than those that were collected on the 20th. This could be due to a couple of different factors. As it only takes

30-50 days for a striped bass to grow out of its larval stage (COSEWIC, 2012), in this time they could follow the current down river until they are strong enough to manoeuvre in the water column (Cooper and Polgar, 1981). Because the collections were not conducted until after the spawning season had virtually ended, the larvae could have potentially drifted further downriver than in the location the samples were taken. Another possible factor could have been the high winds that made it much more difficult to manoeuvre the boat and net during the trawls. Past studies have suggested that striped bass theoretically would not survive to hatch the Southwest Miramichi river due to unattractive environmental conditions that could not support them (Robichaud-Leblanc et. al, 1996), so it was very exciting to observe the presence of the larvae in the samples regardless of the decline in abundance during the second collection day.

The Tabusintac River was sampled due to the fact that it was a historically known spawning location for the Southern Gulf of St. Lawrence population of Striped bass (Melvin, 1991). Because MSA staff was only informed of the spawning taking place on the river but not the specific location that spawning was observed, estimations had to be made as to where the collections should take place. This, along with the late timing of the collections could be a potential factor as to why eggs or larvae were absent in the 5 samples that were taken from the Tabusintac. The larvae could have drifted down further from the sample site before the opportunity arose to start the collections, or spawning could have taken place much further upriver than was estimated.

Even though the survey was successful in finding the presence of striped bass eggs and larvae in the Northwest and Southwest Miramichi Rivers and the absence of striped bass eggs and larvae the Tabusintac river, this project should be continued under a more robust sampling protocol that would characterize the spawning event or quantify the abundance of eggs/larvae. It is suggested that both rivers be sampled more thoroughly, continuing with the ichthyoplankton surveys and also conducting young of the year (YOY) surveys later in the season to observe if the striped bass are developing past the larval stage. It is also suggested that more historic striped bass spawning rivers be sampled in the future for the presence and absence of eggs/larvae.

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