CHAIN PICKEREL PROJECT

Freshwater Fisheries Research Cooperative Final Report

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# TABLE OF CONTENTS

ACKNOWLEDGMENTS ........................................................................................................ 2

PROJECT BACKGROUND .................................................................................................... 3
  PROJECT REASONING ....................................................................................................... 3
  PROJECT SUMMARY ......................................................................................................... 4
  PROJECT BENEFIT TO NOVA SCOTIA SPORTFISHERY .................................................. 4
  PROJECT RELEVANCE TO FRESHWATER FISHERIES RESEARCH COOPERATIVE ...... 4

FUNDING FROM FFRC ........................................................................................................ 5

PROJECT DETAILS ............................................................................................................ 6
  PROJECT LOCATION ......................................................................................................... 6
  METHODS/FIELD WORK .................................................................................................. 6

RESULTS .......................................................................................................................... 7
  INITIAL FINDINGS .......................................................................................................... 7
  LIMITATIONS .................................................................................................................. 7
  UPCOMING WORK .......................................................................................................... 7

TABLES AND FIGURES ..................................................................................................... 8
  TABLES ............................................................................................................................ 8
  FIGURES .......................................................................................................................... 10

OUTREACH AND EDUCATION ......................................................................................... 12
  ARTICLE IN THE Mi'KMAQ MALISEET NATION NEWS ............................................... 12
  ARTICLE IN THE CHRONICLE HERLAD .......................................................................... 13
  UPDATES TO MCG SOCIAL MEDIA ........................................................................... 14
  MAGNETS ........................................................................................................................ 16
  CHAIN PICKEREL COOKBOOK ..................................................................................... 17

REFERENCES .................................................................................................................... 18
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The Chain Pickerel Project staff would like to thank the Nova Scotia Freshwater Fisheries Research Cooperative (Nova Scotia Inland Fisheries) for their financial support and guidance as this was the first year of the project.

Thank you also to fellow Confederacy of Mainland Mi'kmaq employees (especially those within the Department of Natural Resources and Mi'kmaw Conservation Group) for their help with angling surveys, data management, mapping, outreach, and general assistance with the project.

Thank you to the Mi’kmaw Conservation Group Advisory Committee for their interest and guidance.

Thank you to the Clean Foundation for supporting summer students and allowing us to introduce youth to the environmental field.

Lastly, a special thanks to Angeline Gillis, the Associate Executive Director of the Confederacy of Mainland Mi’kmaq, for her support and constant leadership.
PROJECT BACKGROUND

PROJECT REASONING

In 2015, during a priority setting exercise with the Mi’kmaq Conservation Group (MCG), members from Annapolis Valley First Nation identified Chain Pickerel introduction, impact and mitigation in watersheds throughout Mainland Nova Scotia as a priority and a potential research area.

In mid-2017, an article was published by Canadian Broadcasting Corporation (CBC) reported on Chain Pickerel invading critical Atlantic Salmon habitat; the article detailed how Chain Pickerel were intercepting and consuming salmon smolts during their migration out to sea (Withers, 2017). One of the Chain Pickerel caught had four salmon smolts inside its stomach. From this, concerns were raised from the MCG Advisory Committee regarding predation of Atlantic Salmon by Chain Pickerel.

In late 2017, amongst consensus from the MCG Advisory Committee and with the support of Chiefs from various communities, MCG Fisheries Biologist Jillian Arany and previous Aquatic Aboriginal Resource and Ocean Management Manager Alannah Hunt decided to create a project centered around invasive Chain Pickerel.

For the first year of the project, the focus was on learning about the presence/absence of Chain Pickerel in the 28 lakes that flow into the Shubenacadie River. The Shubenacadie River is a 72-km river that runs through the center of Nova Scotia and drains into the Bay of Fundy. To the Mi’kmaq people, this river has significant historical, spiritual, and cultural significance and has helped to support Mi’kmaq for more than 13,000 years (MacDonald, 2018). The river is home to significant food, social, and ceremonial species, other aquatic and terrestrial species, it’s a source of food and drinking water, a place for cultural, ceremonial and recreational activities and a contributor to overall quality of life. Due to the importance of the river, determining the presence/absence of Chain Pickerel in the lakes flowing into the river was deemed as important.

Based on preliminary background research completed in early 2018, it was speculated that presently, there are now 17 lakes that flow into the Shubenacadie River, with confirmed presence of Chain Pickerel (Beaverbank Lake, Bennery Lake, Fish Lake, Fletchers Lake, Kinsac Lake, Lake Charles, Lake William, Lewis Lake, Lisle Lake, Loon Lake, Miller Lake, Nicholson Lake, Powder Mill Lake, Rocky Lake, Shubenacadie Grand Lake, Springfield Lake, and Tucker Lake).
PROJECT SUMMARY
The main goal of this project was to gain more knowledge about Chain Pickerel in the Shubenacadie Watershed. To start the learning process, MCG wanted to learn more about the presence/absence of Chain Pickerel in the 28 lakes that flow into the Shubenacadie River. Angling surveys were conducted by visiting some of the 28 lakes encompassed in the watershed from June 1st to September 30th, 2018 (open fishing season in Nova Scotia). Not all lakes were visited in 2018; however, with the project continuation, angling surveys will be conducted at the remaining lakes. Based on the findings from the angling surveys, Chain Pickerel were either deemed as confirmed via angling (two or more Chain Pickerel were caught), visual confirmation (Chain Pickerel were seen at the location; however, none were caught), no presence (either there was extensive fishing effort and no Chain Pickerel were caught, or seen, or lack of suitable habitat), visited but not yet confirmed (these are lakes where presence is known or has been previously documented, but the angling surveys conducted by MCG were not successful at catching any Chain Pickerel), and lastly not visited (lakes within the watershed that have not yet been visited and angling surveys have not taken place).

PROJECT BENEFIT TO NOVA SCOTIA SPORTFISHERY
Chain Pickerel studies will benefit the Nova Scotia Sportfishery. Chain Pickerel are starting to overpower ecosystems as a top predator due to the fact that they typically prey upon almost anything in the watershed ranging from small fish to larger fish (Atlantic Salmon) and waterfowl (small ducks). As a result, they are starting to reduce the numbers of sport fish. If they continue to thrive and grow in population, they have the potential to overpower most fish species which could be detrimental in many ways.

PROJECT RELEVANCE TO FRESHWATER FISHERIES RESEARCH COOPERATIVE
The purpose of the Nova Scotia Freshwater Fisheries Cooperative (FFRC) is to aid in determining the health and status of the freshwater sport fishery and to evaluate the strategies used to enhance and sustain the freshwater sport fishery. FFRC has new initiatives to improve the sport fishery. A need has developed for additional fisheries assessment activity in the areas of management for Trout species, Smallmouth Bass, Chain Pickerel, and Atlantic Salmon.

This project meets with these objectives through its main objective of gaining more knowledge and insight regarding Chain Pickerel in the Shubenacadie Watershed.

Once the data is collected, it can be used in conjunction with other data, to help determine the health and status of the lakes that flow into the Shubenacadie River. Further, as FFRC has developed a need for additional fisheries assessments activities for Chain Pickerel, this project will help to provide information that can be used for management purposes.

As the area of focus is the 28 lakes that flow into Shubenacadie River and there is already data for some of the lakes, the data collected for this project will build on the previous information and could be used for comparisons.

The main areas of research for this project include fish population dynamics, migration, introduced species, and fish health, which fall under the main research topics listed under FFRC.
The initial amount requested from FFRC was higher than what was received. As a result, there were certain project activities that were not completed.

First, Acoustic Receiver Tag deployment and signage in areas where tagged fish may be caught, was not completed. Further to not receiving funding to this component of the project, there was additional reasoning for removing this activity. Initially, it was thought that tagging fish in the Shubenacadie River system (to learn about movement through the river and possibly identify spawning grounds) would be a possible project activity as the MCG Shubenacadie River Monitoring team already has acoustic sensors deployed. Unfortunately, after discussion, it was determined that the current sensors are too far apart, and it would be unlikely that a Chain Pickerel would travel enough distance to be picked up by multiple sensors. For the tagging component to be completed, multiple sensors would need to be purchased, in addition to the ones already in use. As such, there was no longer a requirement for installing signage in areas where tagged fish may be caught.

Second, under Outreach and Education, there was no Chain Pickerel Derby planned, due to limited funds this year. MCG is looking into the idea of hosting a derby in the future.

From the amount received, MCG was able to purchase field equipment and supplies (including fishing rods, bait, fishing lures, a freezer, clove oil, fish boards, scales, etc).
PROJECT LOCATION
The project was located within the Shubenacadie Watershed (which runs through Halifax County, Hants County, and Colchester County), specifically, the 28 lakes that flow into the Shubenacadie River. As mentioned previously, this location has significant value to the Mił̓kmaq.


METHODS/FIELD WORK
There were two different methods used to collect fish in the field.

The first was angling surveys. Angling surveys can also be referred to as rod and reel fishing. Staff conducted these surveys at all locations visited. For bait, the staff used a variety of different lures and worms. Every Chain Pickerel caught was euthanized (using clove oil), length and weight were recorded, the stomach was dissected to determine contents, the cleithrum was dissected (to be analyzed to determine age), and if possible, the sex of the fish was determined. Any fish other than Chain Pickerel that was caught was recorded and released.

The second was net trapping, using a beach seine. This method was only done once, alongside the team members of the Mił̓kmaq Conservation Group’s Shubenacadie River Monitoring project. The area where the beach seine was used was split into three 25-foot sections. Starting at the first section, the beach seine was pulled through the water, with staff holding onto the sides of the seine. After walking 25 feet, the seine was brought to shore and all captures (aside from Chain Pickerel) were recorded and released. Any Chain Pickerel caught were euthanized (using clove oil), length and weight were recorded, the stomach was dissected to determine contents, the cleithrum was dissected (to be analyzed in order to determine age), and if possible, the sex of the fish was determined. This same procedure was followed for the remaining two sections.
INITIAL FINDINGS
Of the 28 lakes in the Shubenacadie Watershed, we visited a total of 18 locations and conducted angling surveys. These locations included 14 lakes within the Shubenacadie Watershed (Barrett Lake, First Lake, Fish Lake, Fletchers Lake, Kinsac Lake, Lake Charles, Miller Lake, Powder Mill Lake, Rocky Lake, Second Land, Shubenacadie Grand Lake, Springfield Lake, Third Lake, and Thomas Lake), one tributary to the Shubenacadie River (St. Andrews River), the Shubenacadie River directly (Wickwire EZ Canoe Launch and a location used by the MCG Shubeacadie River Team for their fish studies), and Shortts Lake, another lake of interest (Table 1; Figure 1).

Although there was a considerable amount of angling effort, Chain Pickerel were not successfully caught at all the locations visited. Thus, the lakes/locations were divided into five categories (as detailed previously): confirmed (via angling), visual confirmation, no presence, visited (not yet confirmed), and not visited (Table 2; Error! Reference source not found.).

A total of 14 Chain Pickerel were caught over the entire 2018 season; 2 from Shubenacadie Grand Lake, 1 from Kinsac Lake (2 were caught but unfortunately one escaped so it is not included in the final number, but Kinsac Lake is still being marked as confirmed presence), 2 from Third Lake, 5 from the Shubenacadie River (where the beach seine method was used), and 1 from Shortts Lake.

All non-target species (Smallmouth Bass, Brown Bullhead, Yellow Perch, etc.) were noted and released back into the water.

LIMITATIONS
One limitation to this project was the lack of accessibility to lakes. Some of the lakes encompassed in the Shubenacadie Watershed are surrounded by residential houses with no public access. Furthermore, at least one of the lakes is part of Halifax Water and has restricted access (i.e. No fishing).

UPCOMING WORK
Before the 2019 field season, all fish samples from 2018 will be catalogued and a new Chain Pickerel database will be created. This database will house the information collected for each individual fish, including: length, weight, stomach content (if applicable), cleithrum markings (i.e. approximate age), and sex of the fish. It will also house photos of all the fish for future reference. To ensure the precision of the data, verification of cleithrum markings and sex will be done in conjunction with Inland Fisheries.
### TABLES

**Table 1.** The lakes and locations visited, and those that were not, during the 2018 field season.

<table>
<thead>
<tr>
<th>Lakes/Locations Visited</th>
<th>Lake/locations visited within the Shubenacadie Watershed</th>
<th>Lakes not yet visited within the Shubenacadie Watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barett Lake</td>
<td>Barett Lake</td>
<td>Ñâô Lake</td>
</tr>
<tr>
<td>First Lake</td>
<td>First Lake</td>
<td>Beaver Pond Lake</td>
</tr>
<tr>
<td>Fish Lake</td>
<td>Fish Lake</td>
<td>Beaverbank Lake</td>
</tr>
<tr>
<td>Fletchers Lake</td>
<td>Fletchers Lake</td>
<td>Bennery Lake</td>
</tr>
<tr>
<td>Kinsac Lake</td>
<td>Kinsec Lake</td>
<td>Duck Lake</td>
</tr>
<tr>
<td>Lake Charles</td>
<td>Lake Charles</td>
<td>Fenerty Lake</td>
</tr>
<tr>
<td>Miller Lake</td>
<td>Miller Lake</td>
<td>Lake William</td>
</tr>
<tr>
<td>Powder Mill Lake</td>
<td>Nicholson Lake</td>
<td>Lewis Lake</td>
</tr>
<tr>
<td>Rocky Lake</td>
<td>Powder Mill Lake</td>
<td>Lisle Lake</td>
</tr>
<tr>
<td>Second Lake</td>
<td>Rocky Lake</td>
<td>Loon Lake</td>
</tr>
<tr>
<td>Shortts Lake</td>
<td>Second Lake</td>
<td>Solider Lake</td>
</tr>
<tr>
<td>Shubenacadie Grand Lake</td>
<td>Shubenacadie Grand Lake</td>
<td>Square Lake</td>
</tr>
<tr>
<td>Shubenacadie River</td>
<td>Shubenacadie River</td>
<td>Tucker Lake</td>
</tr>
<tr>
<td>Shubenacadie River</td>
<td>Springfield Lake</td>
<td></td>
</tr>
<tr>
<td>Springfield Lake</td>
<td>Third Lake</td>
<td></td>
</tr>
<tr>
<td>St. Andrew’s River</td>
<td>Thomas Lake</td>
<td></td>
</tr>
<tr>
<td>Third Lake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thomas Lake</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2. The presence/absence findings from angling and beach seine survey in the Shubenacadie Watershed for the 2018 field season.

<table>
<thead>
<tr>
<th>Confirmed (via angling)</th>
<th>Visual Confirmation</th>
<th>No Presence</th>
<th>Visited (not yet confirmed)</th>
<th>Not Visited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shubenacadie Grand Lake</td>
<td>Lake Charles</td>
<td>Barrett Lake</td>
<td>Fish Lake</td>
<td>ÑÀò Lake</td>
</tr>
<tr>
<td>Kinsac Lake</td>
<td>Thomas Lake</td>
<td>First Lake</td>
<td>Fletchers Lake</td>
<td>Beaver Pond Lake</td>
</tr>
<tr>
<td>Third Lake</td>
<td>Shubenacadie River</td>
<td>Nicholson Lake</td>
<td>Miller Lake</td>
<td>Beaverbank Lake</td>
</tr>
<tr>
<td>Shubenacadie River</td>
<td>St. Andrewâ€”River</td>
<td>Second Lake</td>
<td>Power Mill Lake</td>
<td>Bennery Lake</td>
</tr>
<tr>
<td>Shortts Lake</td>
<td>Rocky Lake</td>
<td></td>
<td>Duck Lake</td>
<td></td>
</tr>
</tbody>
</table>

The remaining lakes are not included in the table due to space constraints.
Figure 1. The presence/absence findings from angling and beach seine survey in the Shubenacadie Watershed for the 2018 field season, including additional locations and Shortts Lake.
Figure 2. The presence/absence findings from angling and beach seine survey in the Shubenacadie Watershed for the 2018 field season, excluding additional locations and Shortts Lake.
OUTREACH AND EDUCATION

ARTICLE IN THE MI’KMAQ MALISEET NATION NEWS

An article was published in the Mi’kmaq Maliseet Nation News November 2018 edition about the first year of the project. It gave an overview of the project, some of the successes and challenges that were faced.
ARTICLE IN THE CHRONICLE HERALD

An article was published in the Chronicle Herald (one of the main newspapers for the Halifax area) in November 2018. The article provided background information about the project and advertised the cookbook, with hopes that it would lead to some recipe contributions from the general public.
UPDATES TO MCG SOCIAL MEDIA

February 28th, 2019

January 21st, 2019

Call for Recipes!

Do you want to be featured in a cookbook?
Now is your chance!
Do you have a great fish recipe to share?
We bet you do!
Do you want to be a part of MCG's Chain Pickerel Project?
Send us your recipe and let us know if you would like to be featured!
November 19th, 2018

Call for Recipes!

Do you want to be featured in a cookbook?
Now is your chance!

Do you have a great fish recipe to share?
We bet you do!

Do you want to be a part of MCG’s Chain Pickerel Project?
Send us your recipe and let us know if you would like to be featured!

August 19th, 2018

It’s a sad day.

Dreaded invasive fish makes its way into Kejimkujik Park | CBC News
MAGNETS
The magnets were created to share with those who want to get involved with the project and to encourage people to report their catches.
CHAIN PICKEREL COOKBOOK

As the catch limit (for non-First Nations) per person, per day is 100 fish, MCG is in the process of creating a Chain Pickerel Cookbook. The bulk of the cookbook is going to feature fish recipes that have been adapted for Chain Pickerel. The Call for Recipes has been mentioned at numerous meetings, Symposia, in articles, and through social media. When individuals submit recipes, they have the option to be featured, which includes a write-up and picture about the contributor.

The cookbook is going to be available online and in print format by Spring 2019.

Call for Recipes!

Do you want to be featured in a cookbook?  
Now is your chance!

Do you have a great fish recipe to share?  
We bet you do!

Do you want to be a part of MCG’s Chain Pickerel Project?  
Send us your recipe and let us know if you would like to be featured!

MCG’s Chain Pickerel Project is looking for any fish recipes that will go well with invasive Chain Pickerel. Contributors have the option to be featured in the cookbook or, contribute anonymously!

MCG Chain Pickerel Cookbook

Contact Jillian Arany to share recipes
Email: jarany@mkmns-dehr.ca OR cp@mikmaqconservation.ca OR
Phone: 902-890-9961
REFERENCES
