

# CHAIN PICKEREL PROJECT

Freshwater Fisheries Research Cooperative Final Report

*By: Jillian Arany, Fisheries Biologist*

*Mi'kmaw Conservation Group*

*March 2019*



The Confederacy of Mainland Mi'kmaq



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Mainland Mi'kmaq*

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## ACKNOWLEDGMENTS

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 MiꞖmaq employees (especially those within the Department of Natural Resources and MiꞖmaw Conservation Group) for their help with angling surveys, data management, mapping, outreach, and general assistance with the project.

Thank you to the MiꞖmaw 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 MiꞖmaq, for her support and constant leadership.

## PROJECT BACKGROUND

### PROJECT REASONING

In 2015, during a priority setting exercise with the Miꞌkmaq 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 Miꞌkmaq people, this river has significant historical, spiritual, and cultural significance and has helped to support Miꞌkmaq 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 1<sup>st</sup> to September 30<sup>th</sup>, 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.

## FUNDING FROM 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 DETAILS

### 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 Miꞌkmaq.

These 28 lakes are: "A" Lake, Barrett Lake, Beaver Pond Lake, Beaverbank Lake, Bennery Lake, Duck Lake, Fenerty Lake, First Lake, Fish Lake, Fletchers Lake, Kinsac Lake, Lake Charles, Lake Thomas, Lake William, Lewis Lake, Lisle Lake, Loon Lake, Miller Lake, Nicholson Lake, Powder Mill Lake, Rocky Lake, Second Lake, Shubenacadie Grand Lake, Soldier Lake, Springfield Lake, Square Lake, Third Lake and Tucker Lake.

### 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 too 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 Miꞌkmaq 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.

## RESULTS

### 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. Andrew's River), the Shubenacadie River directly (Wickwire EZ Canoe Launch and a location used by the MCG Shubenacadie 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 AND FIGURES

### TABLES

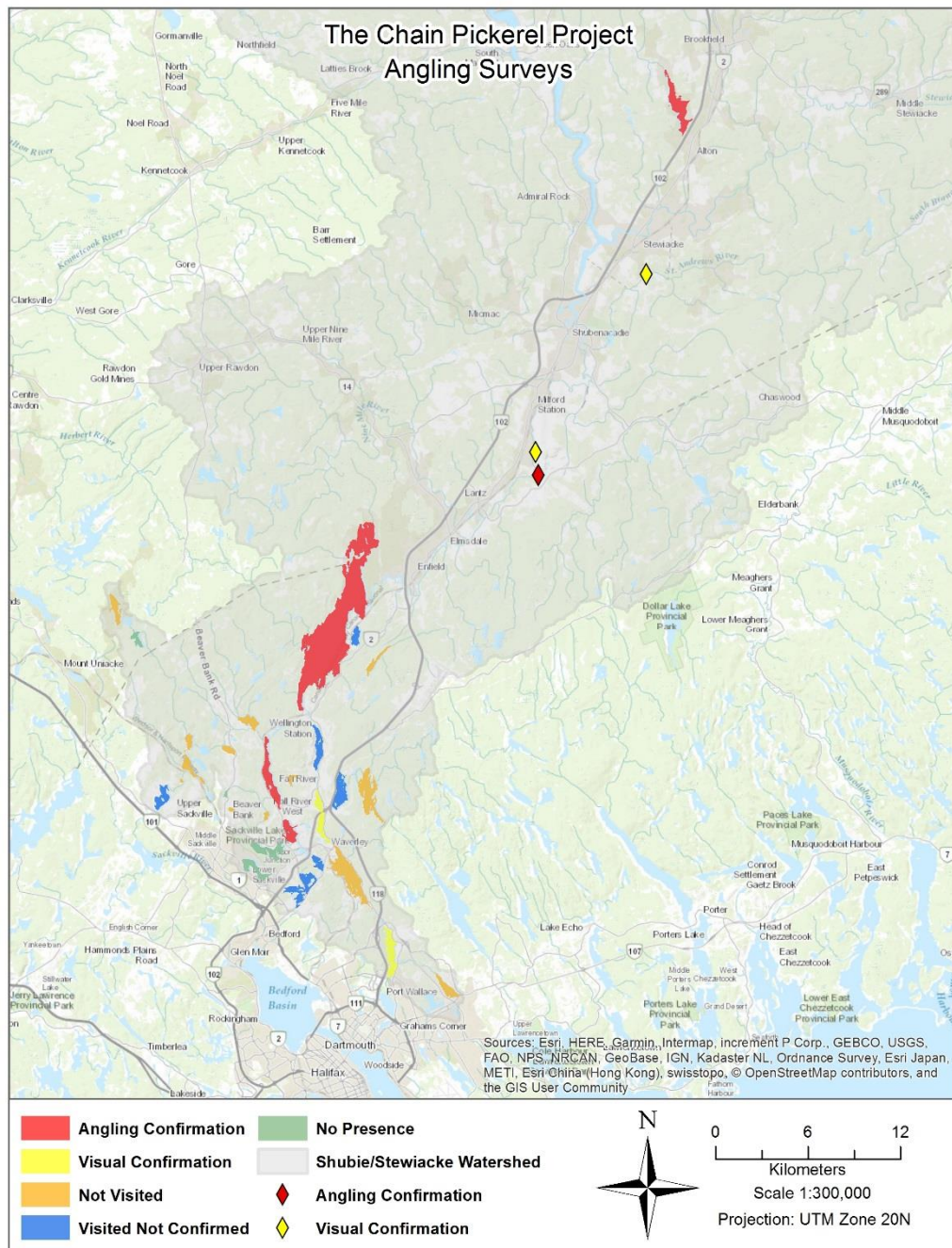
**Table 1.** The lakes and locations visited, and those that were not, during the 2018 field season.

Lakes/Locations Visited	Lake/locations visited within the Shubenacadie Watershed	Lakes not yet visited within the Shubenacadie Watershed
Barett Lake	Barett Lake	õAö Lake
First Lake	First Lake	Beaver Pond Lake
Fish Lake	Fish Lake	Beaverbank Lake
Fletchers Lake	Fletchers Lake	Bennery Lake
Kinsac Lake	Kinsec Lake	Duck Lake
Lake Charles	Lake Charles	Fenerty Lake
Miller Lake	Miller Lake	Lake William
Powder Mill Lake	Nicholson Lake	Lewis Lake
Rocky Lake	Powder Mill Lake	Lisle Lake
Second Lake	Rocky Lake	Loon Lake
Shortts Lake	Second Lake	Solider Lake
Shubenacadie Grand Lake	Shubenacadie Grand Lake	Square Lake
Shubenacadie River	Shubenacadie River	Tucker Lake
Shubenacadie River	Springfield Lake	
Springfield Lake	Third Lake	
St. Andrewø River	Thomas Lake	
Third Lake		
Thomas Lake		

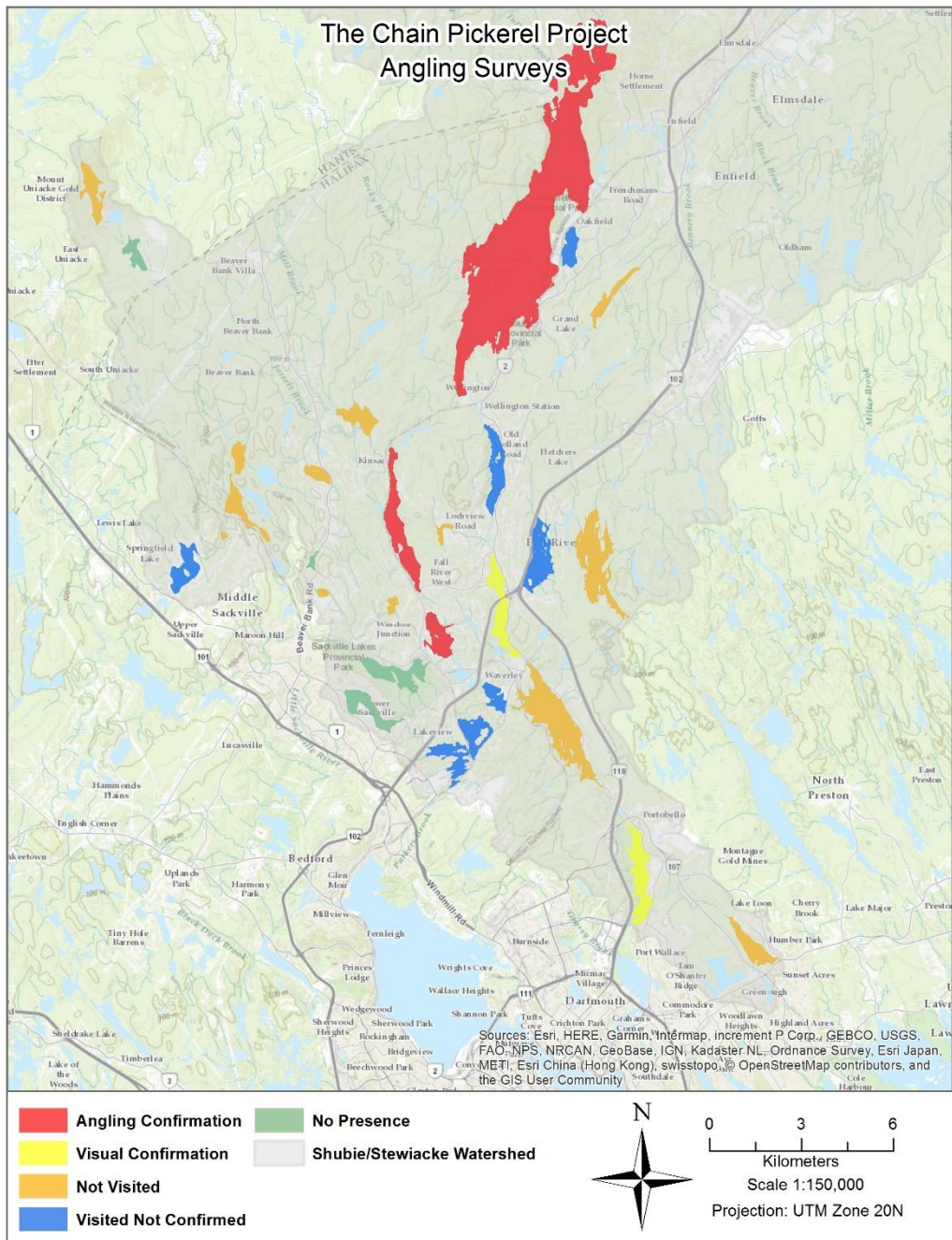
**Table 2.** The presence/absence findings from angling and beach seine survey in the Shubenacadie Watershed for the 2018 field season.

Confirmed (via angling)	Visual Confirmation	No Presence	Visited (not yet confirmed)	Not Visited
Shubenacadie Grand Lake	Lake Charles	Barrett Lake	Fish Lake	õÄö Lake
Kinsac Lake	Thomas Lake	First Lake	Fletchers Lake	Beaver Pond Lake
Third Lake	Shubenacadie River	Nicholson Lake	Miller Lake	Beaverbank Lake
Shubenacadie River	St. Andrewø River	Second Lake	Power Mill Lake	Bennery Lake
Shortts Lake			Rocky Lake	Duck Lake
			Springfield Lake	Fenerty Lake
				Lake Willian
				Lewis Lake
				Lisle Lake
				Loon Lake
				Solider Lake
				Square Lake
				Tucker Lake

## FIGURES



**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.

MI'KMAQ-MALISEET NATIONS NEWS, NOVEMBER 2018

PAGE 13

## The Chain Pickerel Project: Year One

by Jillian Arany  
Fisheries Biologist, MCG

This year, the Mi'kmaq Conservation Group (MCG) started a new project; the Chain Pickerel Project. Chain Pickerel are an invasive species to Nova Scotia, meaning that they are not originally from this region. In 1945, they were illegally introduced into three lakes in Digby. Since then, they have started to invade lakes, rivers and streams around Nova Scotia.

One of the main reasons that MCG decided to create this project is because there is evidence that Chain Pickerel are preying on Atlantic Salmon. In 2017, The Blue-nose Coastal Action Foundation dissected the stomach of a Chain Pickerel from the LaHave River system and found that it had four Atlantic Salmon smolts inside. MCG and many other organizations have dedicated years of hard work toward Atlantic Salmon conservation and recovery. Chain Pickerel as another threat to their survival could be devastating.

This was the first year of the project and our focus was to determine which lakes in the Shubenacadie Watershed have Chain Pickerel presence or absence and learn more about where they spawn, their size, distribution, age, diet, etc. The watershed encompasses 28 lakes which run from Dartmouth out to the Beaverbank/Sackville area and up through Enfield. By completing this work, our team increased their knowledge on Chain Pickerel to help us develop a plan to deal with the on-going invasion.

The presence/absence study of the project involved angling surveys, which was a lot of fishing! Although fishing is a great way to spend a summer day, we faced several challenges including limited access points to lakes, access points not being directly in Chain Pickerel habitat (shallow water with grasses), and lack of success angling. Others fishing the same area as the Chain Pickerel team were generous enough to



A large group of MCG employees out fishing at Kinsac Lake.

donate any Chain Pickerel catches. This was greatly appreciated. To date, we have only been able to visit about half of the lakes, most having confirmed Chain Pickerel presence.

The other part of the project, which focused on learning more information about the fish (under the guidance of Nova Scotia Inland Fisheries), involved the team collecting information from each fish caught. Although the fish caught were euthanized, this was done in a respectful and humane way. Each fish had the same information taken including length, weight, sex, stomach content, and age.

The summer field season may not have shaped up to be what we anticipated, but the information that was collected will be useful for the continuation of the project and the team had a great time while learning! The team included MCG Fisheries Biologist, Jillian Arany; MCG Junior Fisheries Field Technician, Carrie Michael; and one of our 9-week Clean Leadership interns, Dakota.

The project is now creating a cookbook that will showcase recipes for Chain Pickerel, great side dishes, and other useful information. Due to their increasing abundance, we thought this



Lauren Lawrence (MCG Jr. Project Coordinator) showing a Chain Pickerel caught in Kinsac Lake.

collecting data, and get hands-on experience. Keep an eye out for updates on the MCG Facebook page (@mikmaq-conservationgroup), Twitter (@netukulink), Instagram (@mikmaqconservation), or our website (www.mikmaqconservation.ca) for new information related to the project.

If you have any questions or would like to get involved, feel free to contact Jillian at: jarany@cmmsdenr.ca or cp@mikmaqconservation.ca. ☪



Jillian Arany holding a Chain Pickerel caught in Shortt's Lake.



(L-R) Carrie Michael, Janda, and Dakota fishing at Barrett Lake.



A Chain Pickerel caught in Shubenacadie Grand Lake.

## 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.

**Mi'kmaw Conservation Group:**  
**CHAIN PICKEREL PROJECT**  
Jillian Arany, MCG Fisheries Biologist,  
Confederacy of Mainland Mi'kmaq

In April 2018, the Mi'kmaw Conservation Group (MCG), a program administered by The Confederacy of Mainland Mi'kmaq, started the Chain Pickerel Project. Chain Pickerel are an invasive species to Nova Scotia, meaning they are not originally from here. In 1945, they were illegally introduced into three lakes in Digby. Since then, they have started to invade lakes, rivers, and streams around Nova Scotia. One of the primary reasons that MCG decided to create this project was evidence indicating Chain Pickerel are preying on Atlantic Salmon. With the hard work that MCG and many other organizations dedicate toward Atlantic Salmon conservation and recovery; having Chain Pickerel as another threat to their survival could be devastating.

This year, the project team's goal was to determine which lakes in the Shubenacadie Watershed have Chain Pickerel presence or absence. This watershed is encompassed by 28 lakes running from Dartmouth, out to the Beaverbank/Sackville area and up through Enfield. We also want to learn more about the fish, for example where they spawn, size distribution, age, and diet.

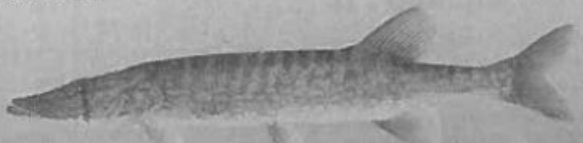
We will be creating a "Chain Pickerel Cookbook" that will showcase how to prepare Chain Pickerel, recipes for Chain Pickerel as a main and some fun side dishes. The 2018 Anglers' Handbook catch limit per person/per day is listed as 100 fish. Due to their increasing abundance, our team thought a cookbook would be a great way to encourage more people to catch and eat them! If you have favourite fish recipes, particularly white fish like haddock, please send them to Jillian (e-mail below).

Keep an eye out for updates on the MCG Facebook page (@mikumawconservationgroup) or our website, [www.mikumawconservation.ca](http://www.mikumawconservation.ca), for any further information related to the project. If you have any questions or would like to get involved, contact Jillian at [jarany@mikumawconservation.ca](mailto:jarany@mikumawconservation.ca) or [cp@mikumawconservation.ca](mailto:cp@mikumawconservation.ca).


**Chain Pickerel Project**

**IF YOU CATCH A CHAIN PICKEREL:**

- Record the length, weight and location of capture
- Email this information to: [cp@mikumawconservation.ca](mailto:cp@mikumawconservation.ca)



**GET INVOLVED!**  
Want to volunteer to help fish out Invasive Chain Pickerel around the Shubenacadie Watershed?  
Email [cp@mikumawconservation.ca](mailto:cp@mikumawconservation.ca) to learn more.





## UPDATES TO MCG SOCIAL MEDIA

February 28<sup>th</sup>, 2019



mikmawconservation • Following

mikmawconservation Invasive Species Week is still in full swing. #invspwk Let's talk about Chain Pickerel!

Chain Pickerel are an invasive species that was illegally introduced into Nova Scotia in 1945. They are a distinct looking fish with a long, slender body, a green/brown chain like pattern on their sides, a white belly, and sharp teeth. Chain Pickerel are a top predator because they will eat just about anything: smaller fish, frogs, ducklings, etc. The biggest concern is that they are starting to prey upon Atlantic Salmon in our freshwater systems.

This year, MCG has been conducting a Chain Pickerel Project to gain more knowledge about Chain Pickerel in the



Liked by lauren1817 and 12 others

2 HOURS AGO

January 21<sup>st</sup>, 2019



**Mi'kmaw Conservation Group**  
 January 21 · 🌐

We're still looking for Chain Pickerel or other white fish recipes for the MCG Chain Pickerel cookbook!

Reach out to Jillian @ jarany@cmmns-denr.ca or cp@mikmawconservation.ca to become involved or for more information!

Let's make these invasive fish into a delicious dish!

#invasivemakeadeliciousdish




## 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 19<sup>th</sup>, 2018

 **Mi'kmaw Conservation Group**  
November 19, 2018 · 🌐

We need YOUR help! 🙏👉

The Chain Pickerel Project is looking for any recipes for fish or great fish side-dishes that you would like to share with us for a "Chain Pickerel Cookbook."

Would you like to be featured in our cookbook? Let us know! Still want to share a recipe but not be featured? That's fine too!

Check the attached poster for details.

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**Call for Recipes!**

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**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 19<sup>th</sup>, 2018

 **Mi'kmaw Conservation Group**  
August 19, 2018 · 🌐

It's a sad day.





CBC.CA  
**Dreaded invasive fish makes its way into Kejimikujik Park | CBC News**



July 6<sup>th</sup>, 2018



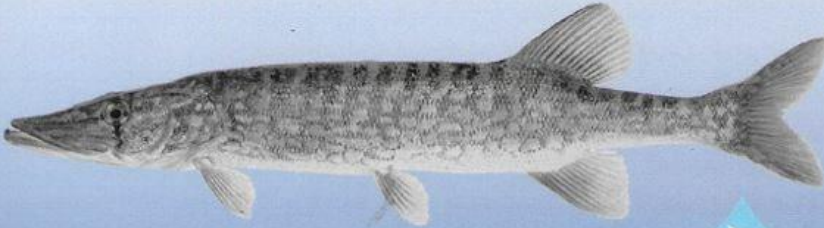
## MAGNETS

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 Project

**IF YOU CATCH A CHAIN PICKEREL:**

- Record the length, weight and location of capture
- Email this information to: [cp@mikmawconservation.ca](mailto:cp@mikmawconservation.ca)



**GET INVOLVED!**  
Want to volunteer to help fish out invasive Chain Pickerel around the Shubenacadie Watershed?  
Email [cp@mikmawconservation.ca](mailto:cp@mikmawconservation.ca) to learn more!



MI'KMAW CONSERVATION GROUP  
THE FARMHOUSE OF MAINLAND MI'KMAW

## 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, Symposiums, 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.

A poster with a light beige background featuring a repeating pattern of small fish. The text is centered and uses a mix of black and red fonts. At the bottom, there is a dark blue section with white text and three white spoons containing different ingredients: green herbs, a logo, and red spices. A small bird logo is in the bottom left corner of this section.

**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@cmmns-denr.ca](mailto:jarany@cmmns-denr.ca) OR [cp@mikmawconservation.ca](mailto:cp@mikmawconservation.ca) OR  
Phone: 902-890-9961



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