

2022 Kejimkujik Angler Diary Report:



Photo by: A. Barkhouse, Parks Canada

It was such a welcome sight to see new and familiar faces of anglers of all ages getting out in Kejimkujik National Park and National Historic Site. Parks Canada staff would like to thank each and every one of you for returning your angler diary this year. The information collected is incredibly valuable for our sport-fish management in the park, providing us with the data required to estimate population abundances, health and angling effort.

Hopefully you have all received your 2022 Kejimkujik Fish Management Crest featuring the Ninespine Stickleback. The response we continue to get for the diary and the crests is overwhelmingly positive from young and old, new and experienced anglers alike. If you did not receive your crest, please reach out to Brandon Nilsen and one will be mailed to you.

Results

Tables 1 and 2 summarise the information collected from the 2022 Angler Diaries that you have returned! In total, there were (?) 804.5 angling hours recorded and 778 fish caught. We are seeing more reported hours and more fish being caught than pre-pandemic; anglers reported 786.5 hours and 700 fish in 2019. Chain

pickerel were identified by anglers as the most popular target species in Kejimkujik, followed by Brook trout. Chain pickerel accounted for 82.4% of all fish caught, and Brook trout accounted for 10.7%. Angling effort continued to be focused on Kejimkujik Lake.

Table 1. Fish species caught

Species	Targeted Species	Number Caught
Brook Trout	83	83
Yellow Perch	8	24
White Perch	4	27
Brown Trout	2	
Brown Bullhead	1	
Golden Shiner	1	
White Sucker		
American Eel		
Creek Chub	1	3
Smallmouth Bass		
Chain pickerel	107	641
Any	116	
Total		778

In 2023, a total of 367 fishing trips were recorded, with the average angler going on 2.3 fishing trips! Anglers spent an average of 5 hours fishing during the 2022 season, with an average of 2 hours per trip. The average number of trips per angler and duration of those trips have increased greatly from the last two years. One angler recorded 49.25 hours, catching 29 Brook trout and removing 225 Chain pickerel from Kejimkujik waters! Not all anglers and fishing trips were successful; however, these zero-catch data points are still valuable information for fish management. Fishing efforts with zero catch help us to estimate fish population and habitat use in both time and space.

Table 2. Fishing effort for 2022 fishing season in Kejimikujik, including total and average hours and catch

	Total	Average / Angler	Average / Trip	Maximum / Angler	Minimum / Angler
Fish Caught	778	4.77	2.3	278	0 (n=58)
Hours Fished	804.5	5	2.3	49.25	0.5 (n=5)

Fishing Regulations

Friendly reminder of the fishing regulations for Kejimikujik that were implemented in 2019. These included:

1. Catch and Release of all native fish
2. Mandatory retention of invasive fish
3. Single barbless hook only
4. No natural bait of any kind

The change in regulations is primarily in response to the increased pressure on native fish species due to the invasion of Chain pickerel in Kejimikujik. These new regulations serve to reduce angling pressure on native fish species, reduce risk of injuries to fish that improve survival catch and release, and reduce pressures on the health of native fish populations. A healthy native fish population is better able to withstand the increased predation and competition associated with the presence of Chain pickerel.

Additional note: although not mandatory, it is a good idea to use a fishing leader. Chain pickerel have multiple rows of teeth on the upper jaw and a single row of larger teeth on the bottom, making it easy for them to bite through regular fishing line. We have found two Chain pickerel with fishing lures in their stomachs, and we want to encourage practices that limit lost tackle (which persists in the environment!)



A fishing lure found in Chain pickerel gut contents.
Photo by S. Boyachek, Parks Canada

Invasive Fish Management and Research

Since the initial confirmation of Chain pickerel invasion in Kejimikujik in 2018, we have been working hard to develop mitigation and management strategies to limit the spread and growth of Chain pickerel populations. The effects on native fish population in Nova Scotia have been observed; however, little is actually known about this invasive species or the cascading effects their introduction have on ecosystems. As result, research and partnership is ongoing with universities, Mi'kmaq, other government departments, volunteers, and NGOs to study various aspect of Chain pickerel. This includes research on Chain pickerel life history, movement patterns, ecosystem effects, and methods to manage the presence of pickerel. Kejimikujik is currently serving as a living laboratory to study Chain pickerel to help develop management strategies to minimize the effects of their invasions on freshwater ecosystems within Kejimikujik and regionally.

A big thank you to all who retained and submitted any Chain pickerel caught in the park. These samples are providing valuable data, including but not limited to their size, sex, and gut contents. The carcasses are being sent to Acadia University where Dr. Avery's lab examines them for further study and comparative analyses. To date, more than 700 Chain pickerel from Kejimikujik have been processed.

Table 3. First confirmed observations of Chain pickerel throughout Kejimikujik.

Location	First Observation
Mersey River	24 June 2018
Loon Lake	20 August 2018
Kejimikujik Lake	22 August 2018
Peskowesk	23 October 2018
Grafton Brook	17 July 2019
West River	31 July 2019
Grafton Lake	22 October 2019
Frozen Ocean Lake	27 July 2020
Big Dam West Lake	14 October 2020
Cobrielle Lake	June 2021

Cobrielle Barriers: In 2019 barriers were constructed in Cobrielle Brook to prevent Chain pickerel movement into the Cobrielle and Mountain Lakes system. Unfortunately, Chain pickerel were discovered in Cobrielle Lake in 2021 during native fish monitoring. Efforts are being made to manage the Chain pickerel population using an electrofishing boat, with the focus on keeping the invasive fish population low to mitigate the potential effects on native fish species. Focus for management is on the Cobrielle system, as Cobrielle and Mountain are unique lakes in Kejimikujik. Cobrielle is the largest clear water lake and Mountain is the second deepest lake, providing excellent cold water refugia for Brook trout and other fish during the hot summer months.

Stable Isotope Analysis:

Saint Mary's University graduate student Delbert has been working to determine the impacts of invasive chain pickerel on the food webs of four lakes in Kejimikujik National Park and National Historic Site (KNPNHS). Specifically, focusing on Grafton, Cobrielle, Big Dam, and Loon Lakes. Stable isotope analysis uses characteristic elemental signatures to define

trophic relationship within aquatic communities.

We collected tissue samples of fishes and invertebrates from each lake and analyzed stable isotope signatures for nitrogen and carbon. The results of these analysis showed that invasive chain pickerel had a significant impact on the food web structure, particularly in lakes with high abundances of Pickerel including Loon and Grafton. Analyses of fish and invertebrate samples show that chain pickerel have been consuming a proportion of the available nutrient resources in these lakes. Resulting in increased pressure on food sources, lower availability of preferred forage and reduced populations of native fishes.

Chain pickerel Life History Study:

Acadia University graduate student Sydney is investigating the life history Chain pickerel and their effects on native fish populations. This study will identify spawning periods of Chain pickerel in Kejimikujik, identify how Chain pickerel presence affects native fish population, and assess the diet of Chain pickerel through rough gut content analysis.

Preliminary results from the gut content investigation shows that the most frequently consumed prey type for Chain pickerel were invertebrates, followed by fish, then amphibians. Of the fish eaten by Chain pickerel, the most consumed species was Yellow Perch. Amphibians found in the gut contents included Yellow-spotted salamander, Red-spotted newt, Pickerel frog, and American bullfrog.

Acoustic Tagging of Chain Pickerel:

In late 2020 and early 2021 staff placed 12 acoustic receivers out in George Lake to track 30 tagged Chain pickerel. These fish were captured in George Lake, tagged using acoustic tags and FLOY or Dart tags, then released back into the lake. This may seem counter-productive to release the invasive Chain pickerel back into the lake, but these 30 tagged individual fish have provided extremely valuable information on

movement patterns, spawning habits, seasonal habit use and range expansion. The acoustic tags inserted surgically into the peritoneal cavity ping every 3.5 minutes and the receivers then use the signal to triangulate that fish's position.

The receivers are being retrieved in spring 2023. The data will subsequently be offloaded and analyzed to begin to answer questions regarding Chain pickerel movement and habitat use.

Caught a Tagged Chain Pickerel?

PLEASE NOTE: This project is now complete and we ask for anyone who catches a tagged Chain pickerel, which can be identified by their external FLOY or Dart tag (see image below), to retain the fish and bring it to the pickerel drop off at the Warden Office located in Kejimikujik. Attaining these tagged fish will provide information on Chain pickerel growth patterns.

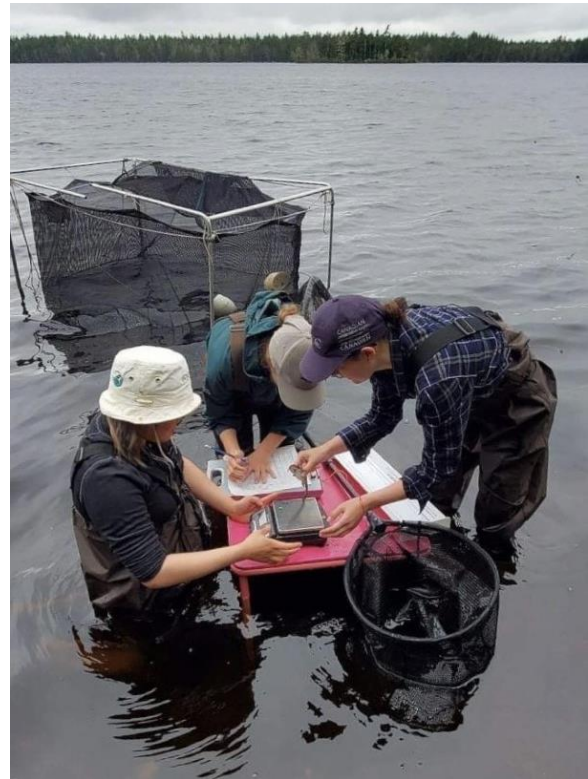


FLOY or Dart tags inserted into acoustically-tagged fish. Photo D. Reid, Parks Canada

Native Fish Monitoring: Our native fish monitoring program started in 2018 shortly after the first Chain pickerel was caught in Kejimikujik and continues in the spring and fall each year. This monitoring consists of setting two large Alaska Trap Nets in Cobrielle, Loon, Grafton, and Big Dam lakes. The purpose of this monitoring work

is to assess the effects of Chain pickerel on native fish abundances and species composition. This monitoring method is non-lethal and lasts for 72 hours, with the captured fish being identified, weighed, measured, and released each 24-hour period.

Comparing monitoring results from Loon Lake (invaded 2018) to Cobrielle Lake (invaded 2021), the results are dramatically different. A net set in Cobrielle catches 200-600 of mostly smaller fish (Banded killifish, Golden shiners, young Yellow perch), whereas in Loon Lake the catch averages 15-20 fish, all fairly large (White perch, White sucker, Chain pickerel). As expected, the impact of Chain pickerel is being first observed on smaller fish.



Native fish monitoring in Big Dam West Lake in May 2022. Photo by K. Currie, Parks Canada.

Electrofishing Boat: In 2020 we received our electro-fishing boat (e-boat). This boat, the world's first all-electric e-boat, is an efficient and powerful tool for invasive fish removal. Since deploying in 2021, we've been able to conduct electro-fishing during

the day and night. During one night, 49 Chain pickerel were collected in 3 hours of shock time, making e-fishing an efficient tool for Chain pickerel removal.

Please remember to turn in any Chain pickerel you catch. All the data we collect is very important in increasing our knowledge and in the development of our management actions. All Chain pickerel can be dropped off at the Warden Office. Look for the big red “Pickerel Drop-Off” arrow. Just put it in one of the compost bags and place it in the freezer. Please mark where and when you caught it, and your contact info if you’d like us to follow up.

Fish Tagging Programs

Since 1985, dedicated trout tagging volunteers have headed out into the park with the provided tagging kits to weigh, measure and tag Brook trout. This program provides us with information on Brook trout movement, growth, spawning and feeding migrations throughout the park and helps us to identify important habitat. Long-term datasets like this are rare in conservation and the continued collection of this data is important as our Brook trout population faces new threats, such as climate change and invasive fish.



Chain pickerel capture in Loon Lake during native fish monitoring. Photo by: K. Currie, Parks Canada.

Brook Trout Creel Census

We would like to send out a big thank you to all who have contributed to the Brook Trout Creel Census over the years. This monitoring program has occurred every five years and runs for three years. The official Creel Census concluded in 2018; however, it was continued beyond the three-year cycle due to the added threat of Chain pickerel. The data collected provides us extremely important, quality data on our Brook trout population especially with increasing climate change impacts. If you are a fly fisher and would enjoy volunteering your time and fly-fishing skills to aid in our research, please contact our Aquatic Project Coordinator, Brandon Nilsen at Brandon.Nilsen@pc.gc.ca.

Volunteer!

If you would like to become a volunteer, we are always looking for folks to join the team in any capacity:

1. The easiest way to help is to fill out your Angler Diary as completely and accurately as you can; the data collected from the diaries is valuable and can add hundreds of hours of effort to our data sampling.
2. Those with fly-fishing experience can contribute to the creel census, and those who prefer spinning gear can target Chain pickerel for removal and study, or fish new areas checking for pickerel presence/absence.
3. If the research team is out in the park, you may be able to join us and assist in checking nets, PIT tagging fish or sometimes we are lucky enough to be out angling!

Any help is appreciated and it contributes to our understanding and monitoring of our native fish species. We host an annual Angler

Information Session in April at Kejimikujik where we highlight the research taking place in the park, our efforts in dealing with invasive fish, discuss all the fishing volunteer opportunities and chat about anything fish related in Kejimikujik. Keep an eye on the Kejimikujik website and Facebook page for more details. All are welcome!

If you would like more information, please contact Brandon Nilsen at brandon.nilsen@pc.gc.ca or 902-682-4003.

www.parkscanada.gc.ca/keji

www.Facebook.com/Kejimikujik



Thank You!

Looking forward to seeing you all
again next year!