

Alberta Conservation Association
2020/21 Project Summary Report

Project Name: Using eDNA to Document the Distribution of Prussian Carp in Alberta

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Partnerships

Alberta Environment and Parks

University of Alberta – Dr. Mark Poesch, Fisheries and Aquatic Conservation Lab

University of Alberta – Natasha Pentyliuk (MSc. Candidate), The Green Lab

Key Findings

- Positive DNA signals confirmed presence of Prussian carp in the Red Deer, Bow, Oldman, and South Saskatchewan river drainages.
- Found no evidence of Prussian carp DNA in the Athabasca, Battle, Beaver, McLeod, Milk, North Saskatchewan, Peace, Pembina, or Smoky Rivers.
- These results align spatially with reports of Prussian carp presence and help fill in data gaps to provide a comprehensive distribution of Prussian carp in the province.

Abstract

Prussian carp is a recent invasive fish species to Alberta, now believed to be widely distributed in the Bow, Red Deer, and South Saskatchewan River drainages. Initial surveys suggest their population and range is expanding exponentially across the province; however, the degree to which the range of Prussian carp has expanded remains unclear. In 2018 and 2019, ACA used environmental DNA (eDNA) to determine the distribution of Prussian carp in Alberta. Positive signals for Prussian carp were detected in the Bow, Red Deer, Oldman, and South Saskatchewan

River drainages but not in the Athabasca, Battle, Beaver, McLeod, Milk, North Saskatchewan, Peace, Pembina, or Smoky Rivers. Our results help fill in details within the known range of Prussian carp, as well as provide a baseline for drainages where Prussian carp have not yet spread.

Introduction

Prussian carp (*Carassius gibelio*) is a recent invasive fish species to Alberta, confirmed in 2006 through the use of DNA (Elgin *et al.* 2014) and now believed to be widely distributed in the Bow, Red Deer, and South Saskatchewan River drainages (Docherty *et al.* 2017). Prussian carp is an aggressive invasive species that can dominate aquatic ecosystems. They can spawn up to three times per year, reproduce asexually, tolerate low dissolved oxygen levels, and have a highly unspecialized, omnivorous diet (Balik 2003, Lamatsch and Stock 2009, Ruppert *et al.* 2017, Şaşı 2008). Initial surveys suggest their population and range is expanding exponentially (Docherty *et al.* 2017) across the province. However, the degree to which the range of Prussian carp has expanded remains unclear. Improved knowledge on this invasive species will help inform decisions on how to manage and protect our aquatic ecosystems going forward.

From 2018 to 2020, in collaboration with Dr. Mark Poesch (Fisheries and Aquatic Conservation Lab, University of Alberta), we determined the distribution of Prussian carp across the province using environmental DNA (eDNA).

Methods

From May through August 2018, we collected eDNA samples from 83 sites, covering major rivers in the province (Athabasca, Battle, Beaver, Bow, McLeod, Milk, North Saskatchewan, Oldman, Peace, Pembina, Red Deer, South Saskatchewan, and Smoky Rivers), as well as some major tributaries and irrigation canals. Sampling followed protocols established by Laramie *et al.* 2015 and Carim *et al.* 2016. At each site, three replicate samples and one control were taken. To collect samples, a sterilized filter cup (0.45µm pore size) was attached to silicone tubing, loaded through a peristaltic pump, and submersed in the water. Once 1,000 ml of water was filtered, the filter was removed from the cup using forceps and placed into a labelled vial filled with anhydrous ethanol. Between replicate samples, forceps were disinfected with a 50% bleach

solution and rinsed twice in distilled water. For the control sample, distilled water was passed through a filter to test for contamination from the filter cups or forceps. After eDNA collection was completed, we recorded temperature, dissolved oxygen, conductivity, pH, and total dissolved solids at the site. Between sites, equipment was treated with 50% bleach solution. All samples were processed at the Department of Biological Sciences Molecular Biology Service Unit at the University of Alberta. In 2019, we resampled 15 sites that came back inconclusive from the lab in 2018 due to sample contamination or inhibition. This year, we are producing a final report.

Results

Of the 83 sites sampled, 14 tested positive for Prussian carp DNA (Figure 1 and 2), indicating their presence in the Bow, Red Deer, Oldman, and South Saskatchewan River drainages. We found no evidence of Prussian carp DNA in the Athabasca, Battle, Beaver, McLeod, Milk, North Saskatchewan, Peace, Pembina, or Smoky Rivers. We had one site in the Beaver River where DNA amplification was inhibited during lab analysis, and one site in the North Saskatchewan River where the sample was contaminated. These results align with currently known spatial distributions of Prussian carp in the province

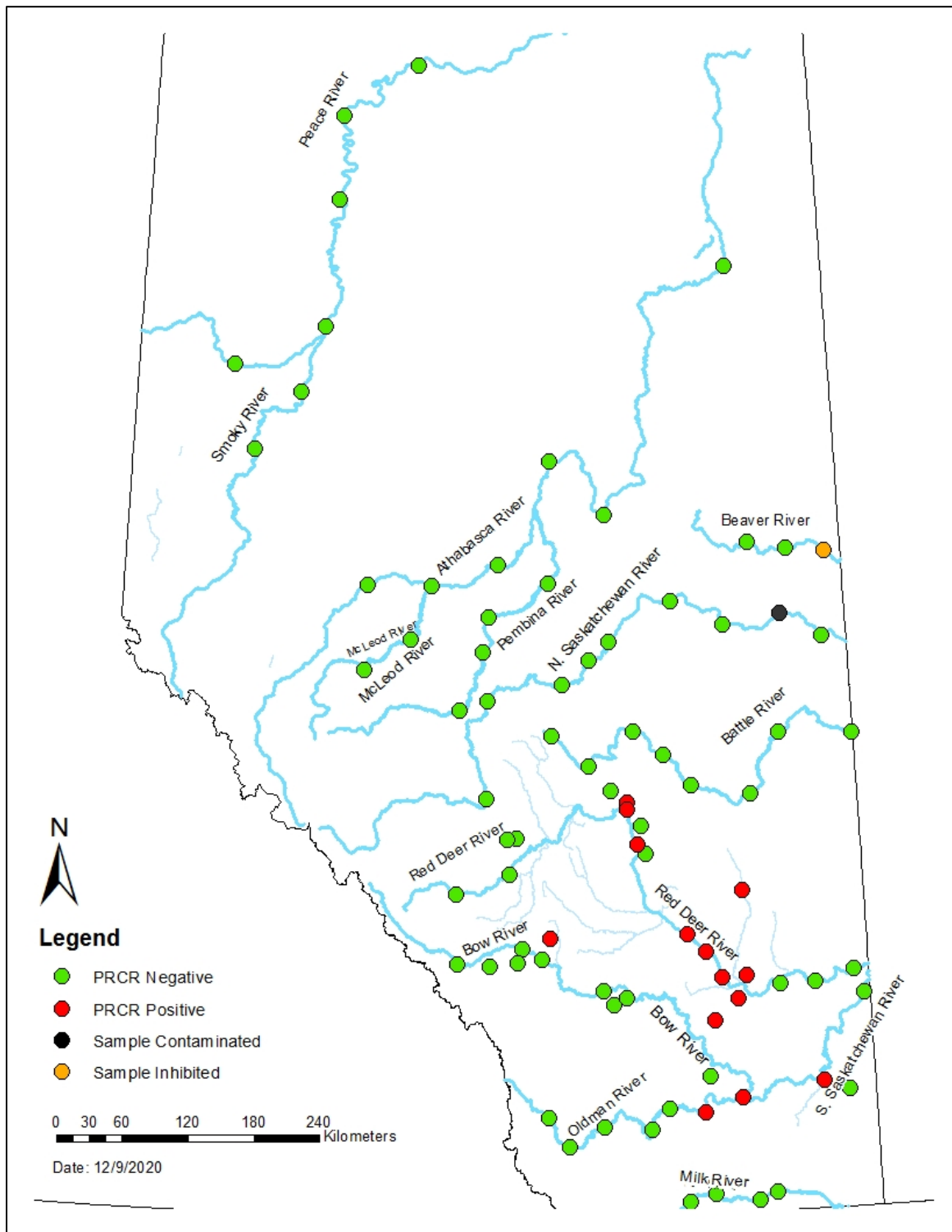


Figure 1. Distribution of 83 sampled sites and Prussian carp (PRCR) eDNA results from 2018 and 2019.

Conclusion

We detected positive eDNA signals for Prussian carp in the Bow, Red Deer, Oldman, and South Saskatchewan River drainages but not in the Athabasca, Battle, Beaver, McLeod, Milk, North Saskatchewan, Peace, Pembina, or Smoky Rivers. These results align with current known spatial distributions of Prussian carp in the province, genetically confirming drainages previously identified as Prussian carp positive. Our results help fill in details within the known range of Prussian carp and provide a baseline for drainages where they have not yet spread, providing a comprehensive, genetically confirmed, distribution of Prussian carp in the province.

Literature Cited

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Photos



Prussian carp captured from Dewitt's Pond. Photo: Kevin Fitzsimmons



ACA summer seasonal staff member, Jamie Card, filtering distilled water control sample. Photo: Britt Schmidt