Plastic Pollution in Arctic Char and their Summer Feeding Habitats

RochmanLab
Ecology & Evolutionary Biology
University of Toronto

Alishba Afaq[1], Bonnie M. Hamilton[1], Chelsea M. Rochman[1]

[1]Department of Ecology and Evolutionary Biology, University of Toronto

UNIVERSITY OF TORONTO

Introduction

- Arctic sea ice is thought to be a reservoir of microplastics[1].
- **Warming temperatures** have resulted in **decreased sea ice volume**, causing the release of **microplastics** into the surrounding environment[2,3,4].
- Fish are important indicators of ecosystem health and can help assess the extent of **plastic pollution** in the Arctic
- **Arctic char** (*Salvelinus alpinus)* are of particular importance in not only ecosystems, but as a food source to local Inuit communities
- There is little research done on plastic pollution in **Cambridge Bay**
- This is the first study to assess microplastics temporally and spatially in Arctic char

Objectives

Determine the presence of microplastics in Arctic char:

1. **Gut content and muscle tissue**
2. **Summer feeding habitats (water and sediment)**

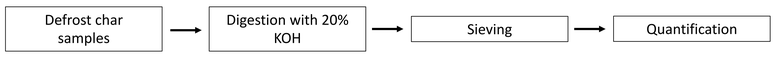

Figure 1. Arctic char content digestion for microplastic quantification.

Methods

Sampling

- **Sampling type** → surface water, surface sediment, and Arctic char
- Samples taken from **freshwater and coastal estuarine habitat** in Cambridge Bay

Microplastic Extraction and Analysis

- **Char samples** → **chemically digested** with 20% KOH, sieved and quantified with stereo microscopy
- **Water samples** → **sonicated**, filtered, and quantified with stereo microscopy
- **Sediment samples** → **density separation** with $CaCl_2$, and quantified with stereo microscopy
- All suspected microplastics categorized by **shape and color**
- 10% of extracted particles subsampled for **Raman spectroscopy** chemical identification
- Laboratory blanks were included for each sample type

Results

Byron Bay 2019: Number of Particles and Category Type

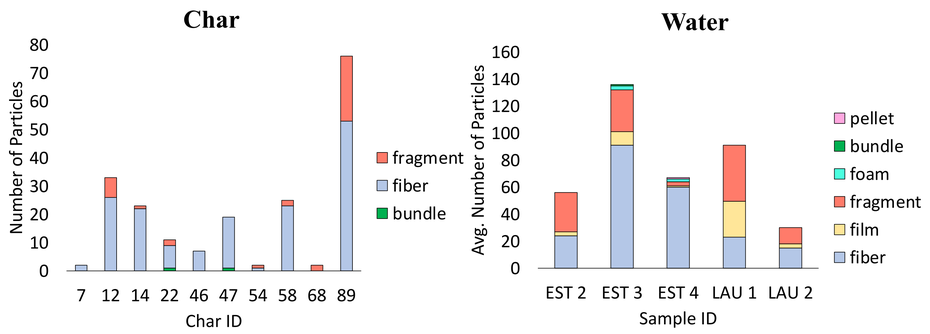

Figure 2. Number of particles and category from surface water and char subsamples.

Byron Bay 2019: Number of Particles and Color Type

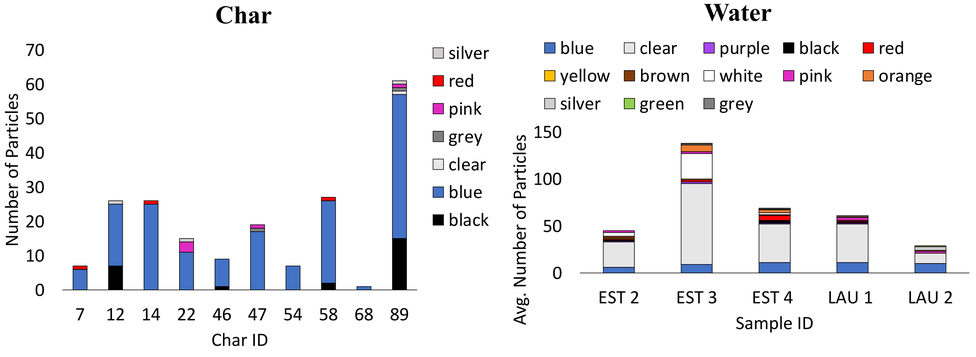

Figure 3. Number of particles and color from surface water and char subsamples.

Byron Bay 2019:Chemical Identification

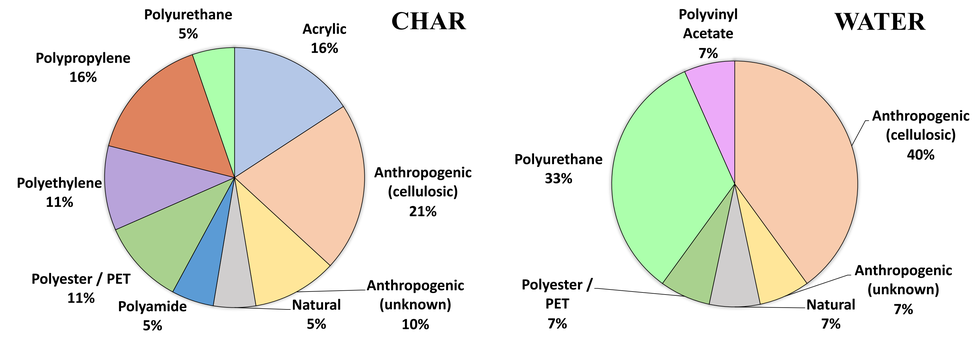

Figure 4. Chemical identification of surface water and char subsamples.

Discussion

- There are **microplastics present** in char and surface water samples from Cambridge Bay
  - In both **freshwater** (Lauchlan River) migratory and **estuarine** feeding habitats
- **Fragments** are more abundant in **freshwater samples**, whereas **fibers** are more abundant in **estuarine samples** (**Fig. 2, 3**).
- Surface water samples include diversified morphology and color compared to char samples (**Fig 2, 3**).
- Most abundant polymer types include anthropogenically manipulated **cellulose** (e.g., dyed cotton, cellulase acetate), **polyurethane**, **polypropylene** and **acrylic**.
- Polymers likely coming from **local** and **distant** sources

Next Steps

- Evaluate mass concentrations of plastics and affiliated chemicals across **multiple char habitats** (freshwater and marine) during **different life stages**
- Future experiments will aim to assess the **combined** effects of contaminants (microplastics and legacy contaminants) and **warming temperatures** on Arctic char and their habitats
- This work can help **inform future conservation efforts** about the emerging concern of plastic pollution in conjunction with climate change at the ecosystem level

Acknowledgments/References

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