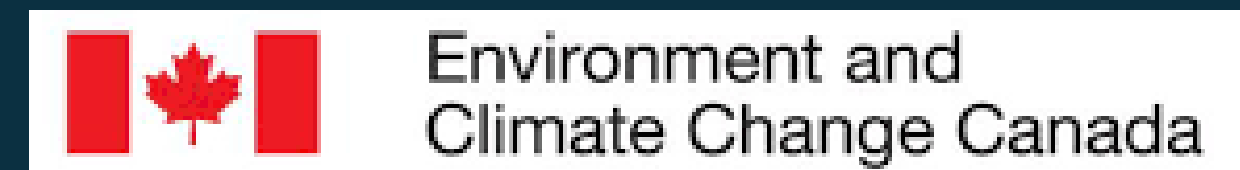


Microplastics and anthropogenic microparticles in surface waters from Great Slave Lake and the Mackenzie River, Northwest Territories, Canada



Madelaine P.T. Bourdages¹, Jennifer Provencher², Jessica Hurtubise³, Jesse C. Vermaire¹
¹ Carleton University; ² Environment and Climate Change Canada; ³ North Slave Métis Alliance



Introduction

- Microplastics are pervasive and persistent in the environment, and understanding the sources, transport pathways, and fate of microplastics in freshwater systems requires further investigation.
- Microplastics have been identified in Arctic marine environments, but little is known about microplastics in Arctic freshwater environments.
- Circumpolar rivers input large amounts of water to the Arctic Ocean, and these rivers could be important transport pathways for microplastics.
- We characterize microplastics and other anthropogenic microparticles in surface waters around Great Slave Lake and the Mackenzie River, NT to assess concentrations in this freshwater system and potential transport to the Beaufort Sea.

Methods

- In July 2021, surface water samples were collected from the Yellowknife River (n = 10), Yellowknife Back Bay (n = 10), and Yellowknife Outer Bay (n = 10) in partnership with the North Slave Métis Alliance.
- In summer 2022, additional surface water samples were collected from similar locations around Yellowknife (n = 24) as well as from Fort Resolution (n = 11) with support from the Fort Resolution Métis Council, Fort Providence (n = 10) with support from the Dehcho AAROM, Inuvik (n = 11) with support from the Aurora Research Institute, and Tuktoyaktuk (n = 8) with support from Keevik Enterprises.
- Samples were collected using a 300 μm Manta trawl, which was towed for 20 minutes per sample, then samples were shipped to Carleton University (Ottawa, ON) for laboratory processing.



Fig 1. Surface water sampling using a 300 μm Manta trawl.

Results & Discussion

- Preliminary data indicate the presence of microplastics and other suspected anthropogenic microparticles in most surface water samples.
- Concentrations of anthropogenic microparticles range from 0-2.3 particles m^{-3} (Table 1) with an overall mean concentration of 0.4 particles m^{-3} from all sites.
- Fibres accounted for 86% of all particles extracted from surface water samples, followed by fragments (12%), films (1%), and foams (1%).
- The 2022 Yellowknife samples still require processing, and extracted particles from all 2022 samples still require identification with $\mu\text{-FTIR}$ spectroscopy.

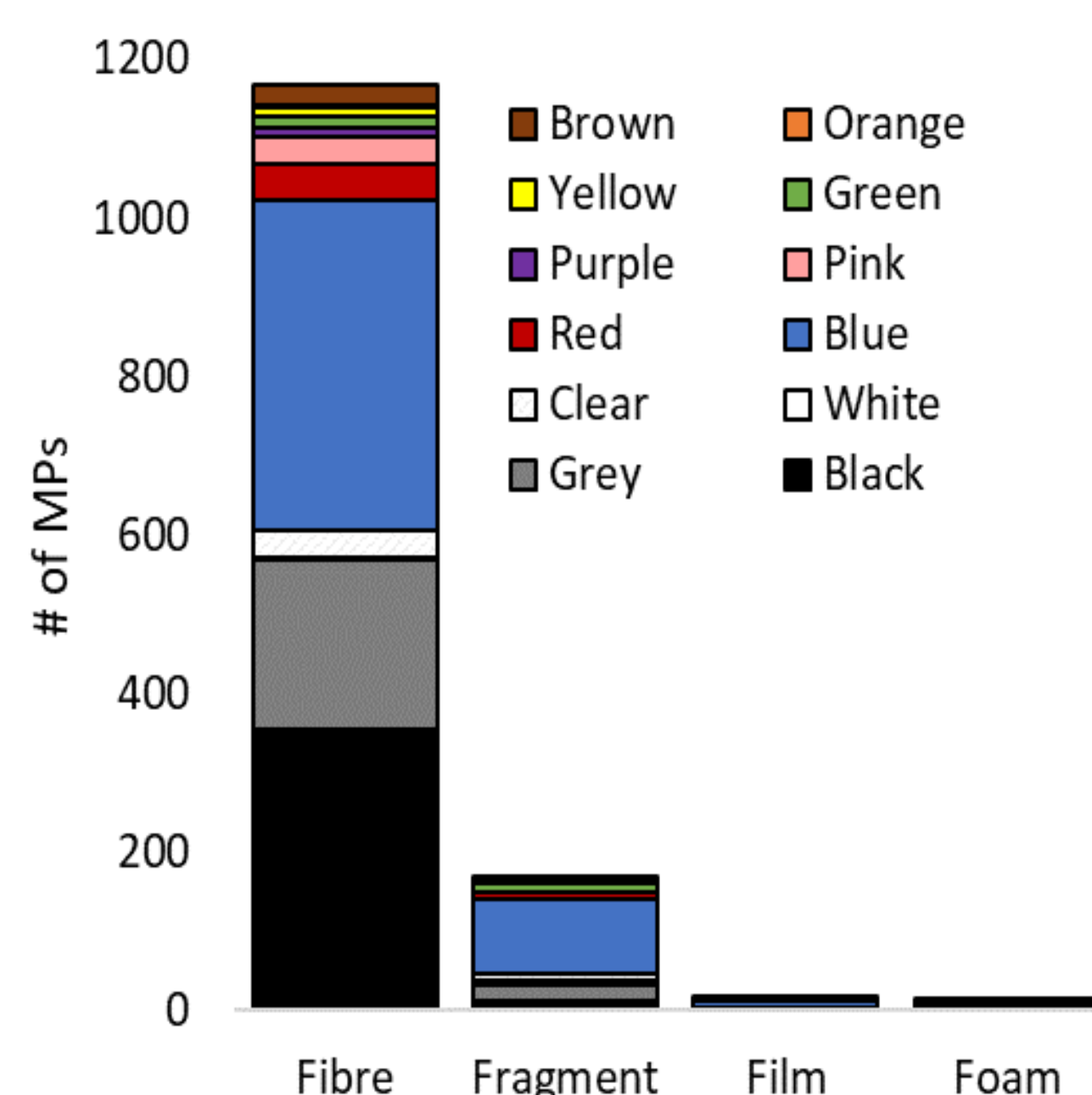


Fig 2. Breakdown of particle shapes and colours. Most particles were fibres, and were either blue, black, or grey.

Table 1. Range and mean concentration of microplastics and other anthropogenic microparticles found at each sampling area.

Location	MPs/ m^3 (range, mean)
A. Yellowknife	0.03-2.04 (0.42)
B. Fort Resolution	0.09-2.30 (0.63)
C. Fort Providence	0-0.54 (0.11)
D. Inuvik	0-1.64 (0.49)
E. Tuktoyaktuk	0.08-0.67 (0.26)

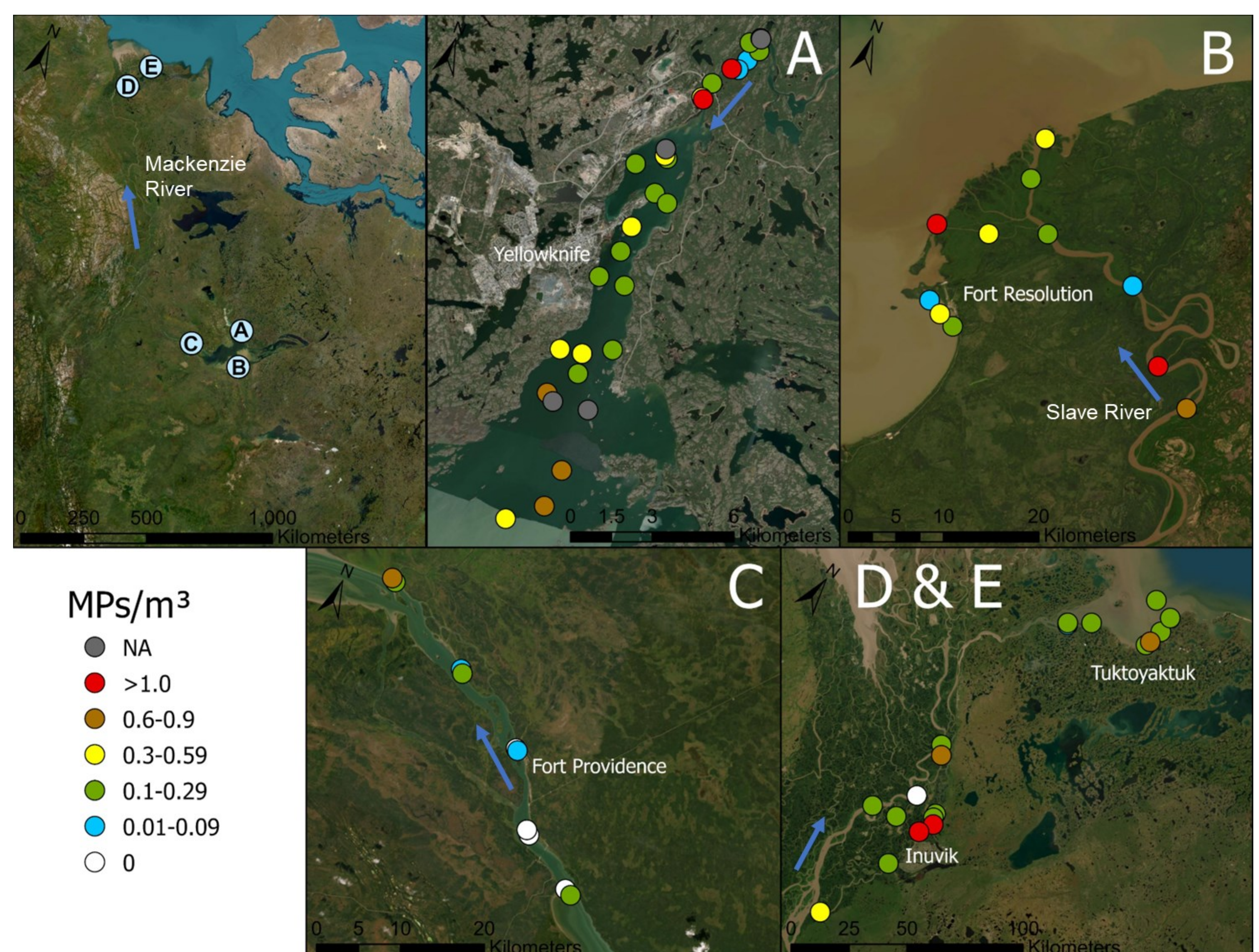


Fig 3. Sampling sites with concentrations of microparticles m^{-3} . A: Yellowknife; B: Fort Resolution; C: Fort Providence; D: Inuvik; E: Tuktoyaktuk.

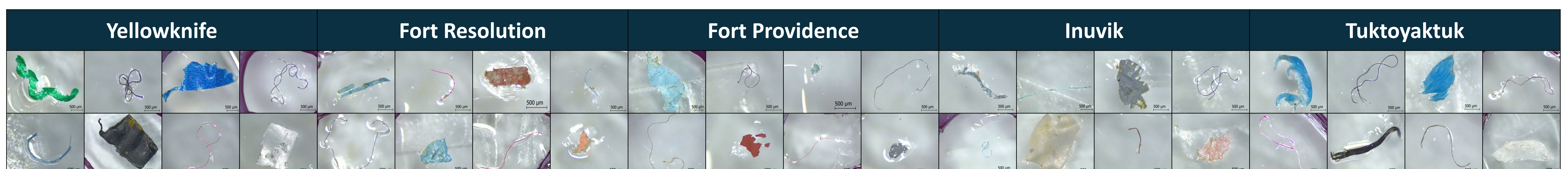


Fig 4. Examples of microparticles extracted from surface water samples. Particles will be identified using $\mu\text{-FTIR}$ spectroscopy.