Microplastics' Composition and Role as Vectors for Persistent Organic Pollutants

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INTRODUCTION

Plastic is everywhere and once in a water body, some break down into pieces less than 5mm known as microplastics (MPs). MPs come from various sources, and it is hard to know where they originate. Previously published studies have relied on Fourier Transformed Infrared (FTIR) to identify the types of MPs[1]. In this study, FTIR imaging system was used to determine the composition of MPs in the samples collected in the tidal freshwater Potomac River.

Recent studies have also raised concern over the ability of plastic particles to accumulate persistent organic pollutants (POPs), organic compounds that are resistant to environmental degradation[2]. Therefore, this study also aimed to investigate the presence and distribution of POPs absorbed to the post-consumer microplastics deployed into the Occoquan River.

Hypothesis 1

$H1_o$: Microplastics are <u>uniform</u> in composition

$H2_a$: Composition of plastics is <u>diverse</u> in the sample

Hypothesis 2

$H2_o$: Microplastics <u>do not accumulate</u> persistent organic pollutants (POPs)

$H2_a$: Microplastics are found to <u>uptake</u> POPs from the environment

METHODOLOGY

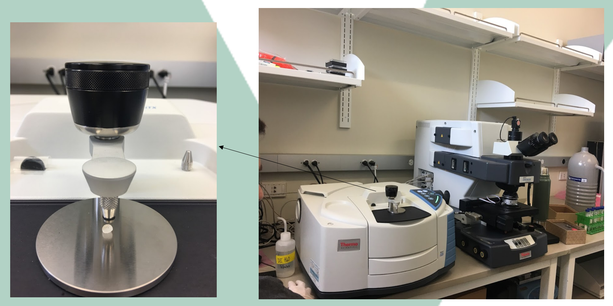


Figure 1. Surface samples of microplastics from Hunting Creek were collected and processed prior to visual identification using a dissecting microscope. FTIR instrument was used to identify different types of microplastics. Samples were chosen, which represented the most abundant categories (color and type) of MP found in field samples.

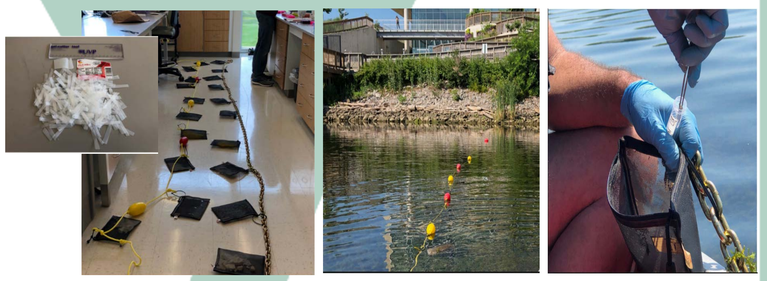
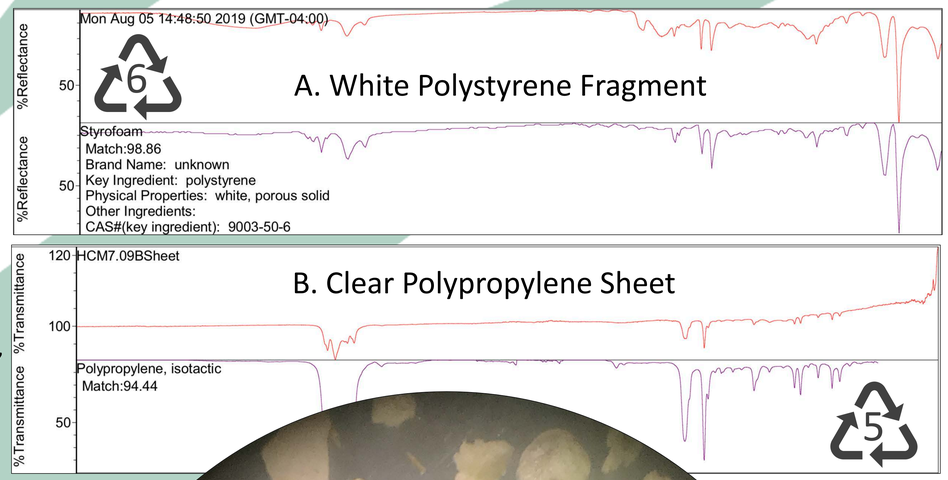
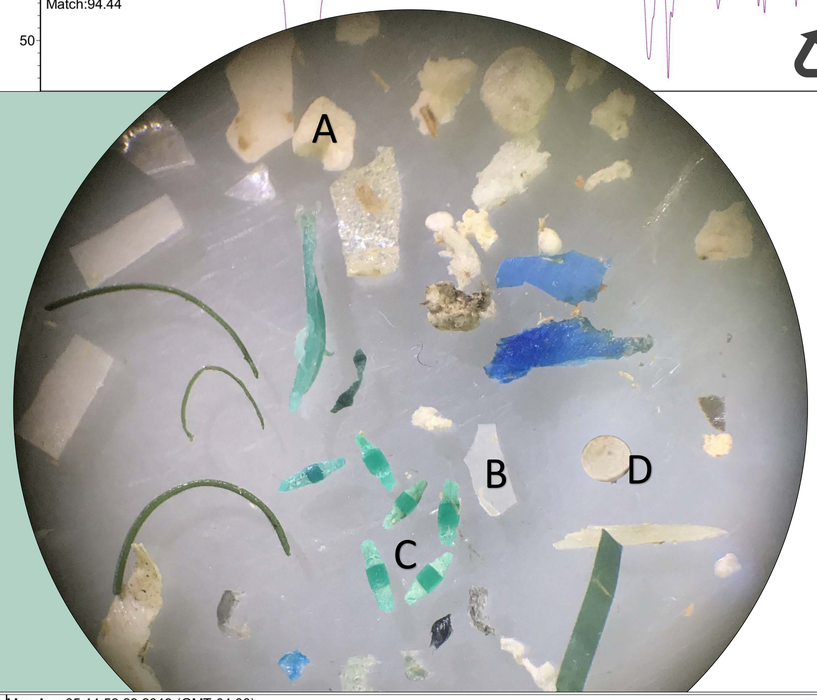


Figure 2. Various post-consumer plastics were cut into small pieces and put in mesh bags. Ten mesh bags were attached to buoys so that they floated in the water, and the other ten were weighted at the bottom with a chain. After 3 weeks, samples in the mesh bags were collected in vials and brought to lab for processing.

RESULTS





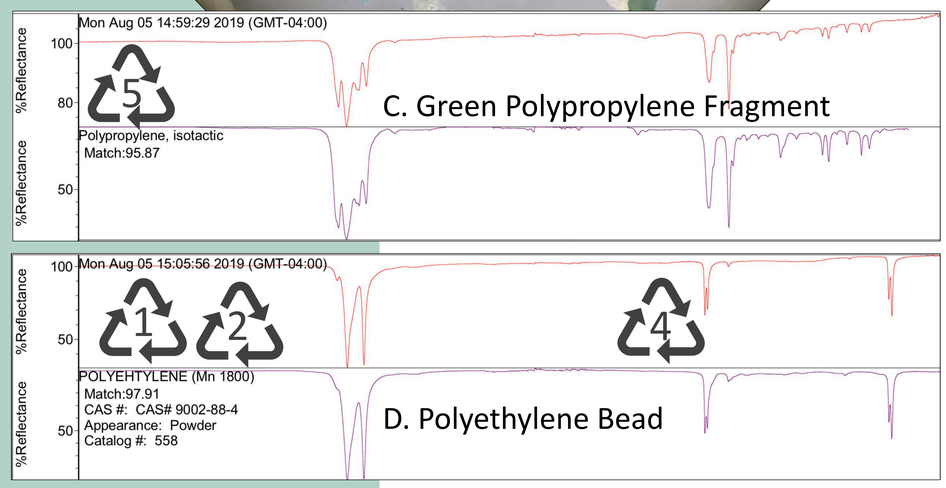


Figure 3. Composition of microplastics by FTIR analysis

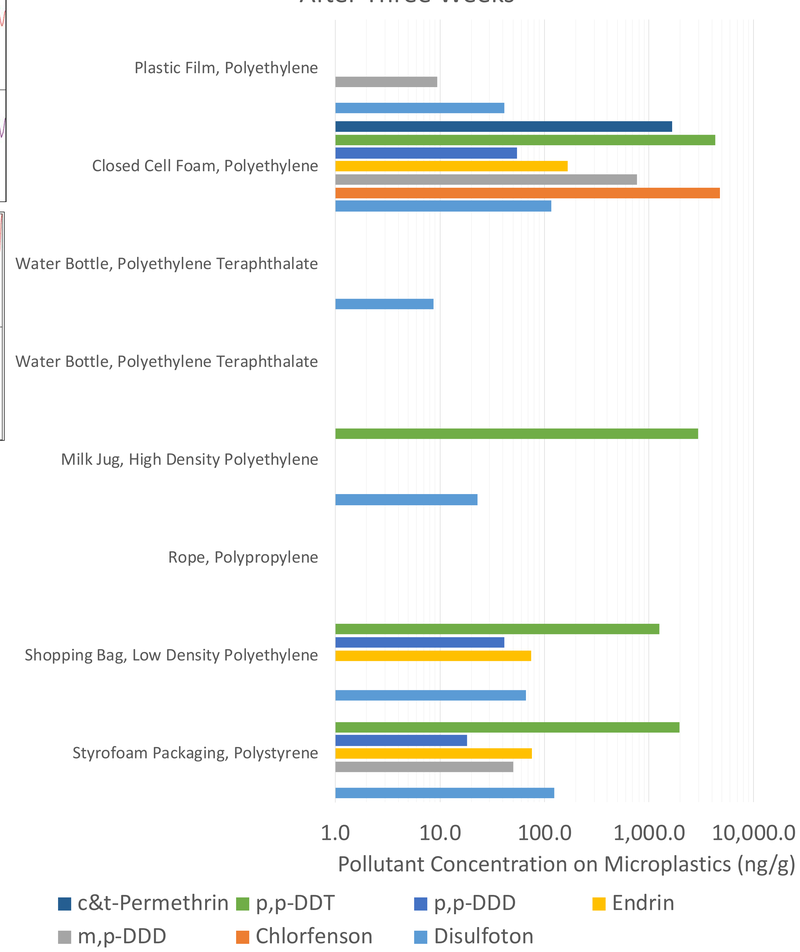


Figure 4. Absored POPs on bottom deployed microplastics after 3 weeks

CONCLUSIONS

- Microplastics vary in composition in the sample collected, supporting the alternative hypothesis. Three types of microplastics were found: polyethylene, polystyrene, and polypropylene. Polystyrene is the most dominant amongst all three.
- Bottom deployed microplastics are found to absorb POPs, supporting the alternative hypothesis.

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