



Hudson River Park



Microplastic Abundance in Hudson River Park, NYC

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Introduction

Microplastic debris (<5mm in diameter) is a rapidly growing concern for the world's marine systems, as they have a wide range of deleterious effects and are ingested at many trophic levels. While recently the abundance and distribution of microplastic particles in the American Great Lakes and NY-NJ Bay regions has been quantified, very little data of this type exist for the Hudson River Estuary.

Objective

- To quantify and categorize microplastic debris at channel and near shore sites.
- To obtain baseline data on microplastic concentrations.

Methods



- During each trawl, a 1.5m wide, 0.3mm mesh neuston net collected samples within a 1L container.
- Samples were filtered through a stacked series of sieves (0.3mm, 1mm, and 5.6mm) and dried at 90°C overnight.
- Organic matter was degraded using wet peroxide oxidation; samples were divided using salt gradient density separation, and plastics were filtered out using a 0.3mm nitrex sieve.
- Plastics were counted and categorized based on size and type using 10x-30x magnification dissection microscopes.

Results

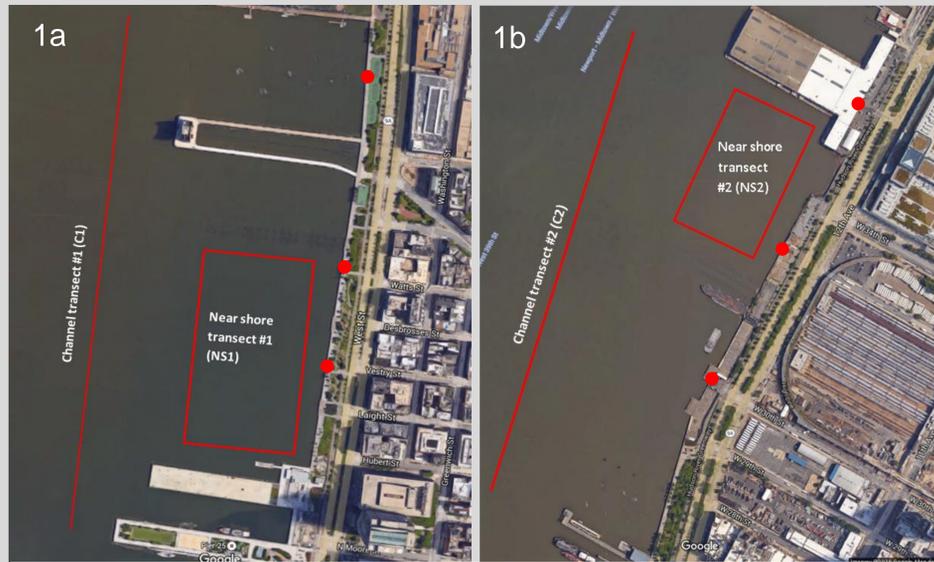


Fig. 1a and 1b Satellite images of trawling sites conducted monthly (July-Oct. 2016) at both channel and near shore locations within Hudson River Park's downtown and midtown waters. Red dots indicate Combined Sewer Outfall (CSO) points.



Fig. 2 Microplastic pieces found in a processed sample during microscope analysis.

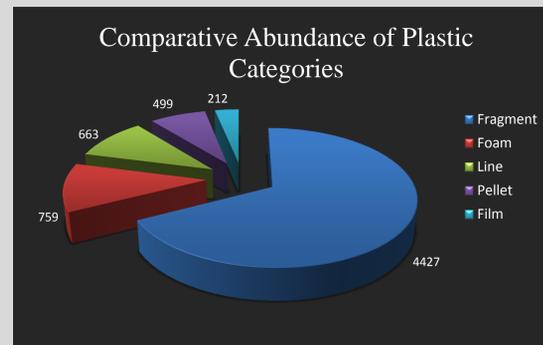


Fig. 3 Microplastic pieces were counted and categorized in accordance with NY/NJ Baykeeper's methods.

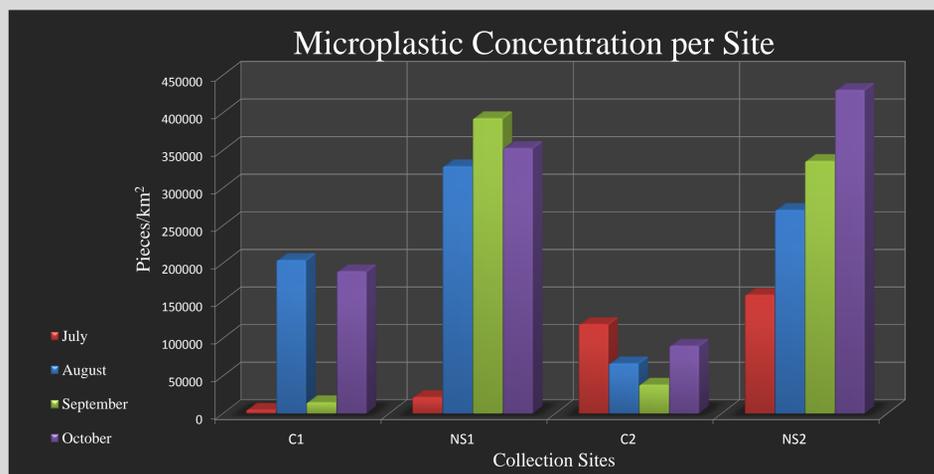


Fig. 4 Microplastic concentration for each site was calculated by dividing the number of pieces by the product of the trawling net's width and the distance traveled (Concentration = Pieces / .0015km x ~1.625km).

Quantities of microplastic pieces varied by site and date (Fig.4) with fragments comprising nearly 70% of plastics categorized (Fig.3).

- Channel sites (C1 & C2) exhibited concentrations below 200,000 pieces/km² (Fig.4).
- Near shore sites (NS 1 & NS2) exhibited higher concentrations than channel sites, frequently above 250,000 pieces/km² (Fig.4).
- There was a significant difference in concentration between channel and near shore sites (P<0.01), however, no significant difference in concentration between Site 1 (Fig.1a) and Site 2 (Fig.1b) (P=0.99).

Discussion

This survey's average concentration of 188,657 pieces/km² was consistent with NY/NJ Baykeeper's 2016 study in the NY-NJ Harbor.

The significantly higher microplastic concentration at channel sites compared to near shore sites may be the result of reduced flushing between piers and near the shoreline.

There was no correlation between rainfall four days prior to the trawling dates and microplastic concentration.

- This finding could suggest that the majority of plastics collected did not enter the river via the CSO points.
- The majority of microplastics that would be expected to exit from such CSO points – textile microfibers – are too small to catch with a 0.3mm mesh net.

Further surveys may be able to control for more variables not investigated in this study.

- Test for tidal effects by ensuring equal number of sampling dates on ebb and flood.
- Test for CSO effect by selecting trawling sites with a gradient of distances from outfall points.

This study broadens understanding of local microplastic concentrations and contributes to a regional goal of building a robust microplastic database in the NY-NJ Harbor.

References

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- NY-NJ Harbor Estuary Plastic Collection Report. (2016) NY/NJ Baykeeper.
- Microplastic is an Abundant and Distinct Microbial Habitat in an Urban River (2014). McCormick, A., Hoellein, T.J., Mason, S.A., Schluep, J., and Kelly, J.J. American Chemical Society.

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