An estimated 10,000 tonnes of plastic pollution enter the Great Lakes annually\(^1\) – with an estimated 1451 tonnes entering Lake Ontario\(^2\). The debris enters the lake via several pathways including runoff from land, litter from vessels, and wastewater treatment plants. Trash capture devices are one way to prevent plastic and other anthropogenic litter from entering the lake from waterways.

Recently, PortsToronto installed Seabins to capture litter along the Toronto waterfront. Two bins were installed at the Outer Harbour Marina and two at Pier 6. Preliminary analysis shows promising results in their ability to capture diverse plastic pollution of all sizes and divert it from the lake.

Plastic Pollution in Lake Ontario

Plastic pollution of all sizes is prevalent on Toronto’s waterfront. It has been present in sediment records of Lake Ontario for over 40 years\(^3\). In addition to being an eyesore, plastic pollution poses a hazard to wildlife through entanglement or ingestion\(^4\). To help inform local sources and help determine which areas are most affected, we set out to learn more.

A visual walking survey of several slips in Toronto’s harbour demonstrated just how much litter is present. Plastic pollution could be seen cluttered near the slips at every site, and more than 400 pieces of plastic were present at some sites. Most notably, site 4 located at St. Peter’s Basin, Site 2 at Marina Quay West, and site 8 located at Marina Four had the most debris. Two surveys were done: once after a wet event with significant rainfall >10mm and once on a dry day (without rainfall). In general, there was more debris after wet events. These results, showing ubiquitous litter on our waterfront, suggests trash capture devices have great potential to mitigate local habitat and recreational waters.
Seabin Trial

Trash capture devices capture litter and clean aquatic environments. Some examples of these include Littatraps, Seabins, and Trash Wheels. These devices not only capture debris, but also help capture the public’s attention and provide data to inform sources and solutions.

During Summer and Fall of 2019, PortsToronto piloted two Seabins in each of the Outer Harbour Marina and Pier 6. They were deployed to reduce the amount of plastic reaching Lake Ontario. Seabins work by skimming the surface layer of the lake for debris >2mm in size.

To assess the efficacy of the bins, and to characterize the captured debris, the U of T Trash Team audited the litter from the bins over seven consecutive days.

Seabins Capture Litter!

The Seabins captured between 309 and 2568 pieces of litter per day, for a total of 8785 pieces over the course of seven days. The most common large debris items captured were wrappers, fragments, and cigarette butts. The most common small debris captured were fragments, styrofoam, and pre-production pellets. Styrofoam, likely blown by the wind, comes from construction or packaging. What surprised us most, was the ability of the Seabins to capture microplastics, including pellets in every bin. Pellets are a form of pre-production plastic that comes from industry; they can get into the aquatic system due to spills when being transported5.

During the seven days where the Seabin debris was collected, there seemed to be no clear pattern on the influence of rain or wind. More research and long-term data collection is recommended to determine any significant effects.

<table>
<thead>
<tr>
<th>Large Debris</th>
<th>Small Debris</th>
</tr>
</thead>
<tbody>
<tr>
<td>374 Wrappers (37%)</td>
<td>3968 Fragments (47%)</td>
</tr>
<tr>
<td>239 Fragments (24%)</td>
<td>2726 Styrofoam (33%)</td>
</tr>
<tr>
<td>69 Cigarette butts (7%)</td>
<td>900 Pellets (11%)</td>
</tr>
</tbody>
</table>

Top 3 items found in debris from all four Seabins separated by size.

![Seabin net capturing debris at Pier 6 (Site 9).](image)
Examples of small debris found in Outer Harbour Marina Seabins in August 2019.

Signage about the Seabin pilot by Pier 6 where two devices had been installed.

Next steps

- Install more plastic mitigation devices such as Seabins or a Trash Wheel in concentrated debris areas in Toronto’s waterways and along the lake.
- Inform policy through continued monitoring of debris to understand the sources and fate of local plastic pollution.
- Increase signage to engage and educate the community.
- Reduction of single-use plastics that are commonly found in the Seabins (i.e. straws, bags, etc.) through policy.
- Implementing more accessible areas for people to properly dispose of their waste.

References
3. Corcoran et al., 2015, Environmental Pollution.
4. Rochman et al., 2016, ET&C.

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