Microplastic Sampling in Coastal Waters

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Here are some simple methods for investigating microplastic pollution in water samples. These methods are appropriate for upper elementary school-aged students through adults. They do not require the use of chemicals, but do require some relatively sophisticated lab equipment. These are the protocols being followed by the Florida Microplastic Awareness Project.

**Materials needed:** 1-liter bottles (any variety, but if purchasing, wide-mouth Nalgene bottles work well); vacuum filter apparatus that can take 47-mm filters; 0.45 micron gridded filters; filter forceps; squirt bottle, tap water; 1-liter separatory funnel and stand/clamp, dissecting microscope (20-30 or 20-40 X).

**Procedure:**

1. Triple-rinse 1-L bottles with water at your collection site. Be sure to discard your rinse water downstream of where you/others are collecting samples. If using Nalgene bottles, you probably do not need to be concerned about contamination by plastic from the threads, but if you are using other types of plastic collection bottles, you should line the lids with foil.

2. Immerse the sample bottle sideways (holding it horizontally) into the water until it is just submerged. Allow it to fill with water and cap it underwater.

3. You can let samples sit for weeks before processing (they do not need to be refrigerated, although they should be kept in the dark to prevent algal growth in the bottles).

4. Run about 100 ml of tap water through a 0.45 micron filter (vacuum filter it). Use this to rinse the inside of the side-arm flask (the one you've used to collect it in) and discard. Repeat 2 more times. (Essentially you are triple-rinsing the flask with filtered water). Similarly triple rinse a squirt bottle
with filtered tap water. Collect the next 500 ml of filtered water and use it to stock the squirt bottle. You will use this filtered water for rinsing the funnel, etc.

5. This part is optional, but recommended (it will make the samples much easier to filter). When ready to process, triple rinse a 1-L separatory funnel. Pour the sample into the funnel (supported by a clamp on a heavy-duty stand). Let sample stand for at least a few minutes. Drain off the sand/silt from the bottom of the sample into a cup (this will be discarded).

6. With no filter inserted, rinse the inside of the filter apparatus with pre-filtered water. Use a petri dish or other flat object as a cover for the filter apparatus (only remove when adding more sample). This will help reduce environmental contamination of the sample (e.g. by lint in the air).

7. Insert the filter (gridded) into the apparatus. Add sample to fill the filter funnel. Put remaining sample back on the clamp and allow to further settle (keep the separatory funnel or sample bottle stoppered). Drain sediment from the separatory funnel as needed.

8. With the cover over the filter funnel, vacuum filter the sample. Add more sample until it has all been run through the filter. Rinse the sides of the filter funnel with a small amount of filtered water once your sample has been entirely filtered.

9. Release the vacuum pressure. Remove the filter and place into a clean petri dish. Cover with the petri dish lid. Remember to label the sample (either on the petri dish lid, or with a small strip of paper placed inside the petri dish, but not on the filter).

10. Let the filter dry at least overnight before viewing under a microscope (not required, but it's easier to differentiate plastics from plankton once the plankton have dried out somewhat. It's also easier to scan without the reflection from the wet filter).

11. If processing several samples collected in the same general location one right after the other, you do not need to rinse the separatory funnel or filter funnel in between...but should do so before switching sample locations.

12. Observe the filter papers under a microscope at 20X magnification. Scan the filters systematically,
moving row by row to prevent double-counting or missing plastics. Plastic will generally be milky/white or colored (not clear). Sand grains are easily mistaken for plastics. Many of the fibers seen on the filters will be extremely small.

13. Refer to the Marine and Environmental Research Institute’s *Guide to Microplastic Identification* for help in determining what is and is not plastic.

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**Plastics on filters (grid size of filters is 3 mm x 3 mm)**

Photo credits: Maia McGuire
### Plankton on filters (from saltwater samples)

Photo credits: Maia McGuire

<table>
<thead>
<tr>
<th>Copepod</th>
<th>Ostracod</th>
<th>Polychaete worm</th>
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<tbody>
<tr>
<td>Zoea larva (crustacean)</td>
<td>Copepod with egg sacs</td>
<td>Bivalve larva</td>
</tr>
<tr>
<td>Copepod (top); snail larva (bottom)</td>
<td>Diatom (top view) (often confused with plastic, but diatoms are fragile and will crush when “poked”)</td>
<td>Diatom (side view)</td>
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Sand grains (will sink when placed in a drop of water)