

# CSI for the Ocean Equipment List

The following equipment is needed for each part of the sampling, processing and analysis. Some substitutions will work. Note: we are not the biggest fans of Amazon, but understand how easy it is to get nearly everything from one source. All links are suggestions only and equipment we have used.

## Sampling:

| Item  | Link to example                  | Substitution options/limitations  |
|---|----------------------------------|---|
| <b>Metal bucket</b>                               | <a href="#">Home Depot</a>       | Metal only (not plastic). Any metal bucket that holds more than the jar will do.  |
| <b>Rope for bucket: orange</b>                    | <a href="#">Home Depot</a>       | White cotton or other white natural material. Do not use blue, red or black synthetic or natural material.  |
| <b>Glass jars: 1L or 1 quart</b>                  | <a href="#">Target</a>           | Any glass jar will work, even washed pasta sauce jars from the pantry. The key is that they are, ideally, 32oz or 1L (or more). Aluminum/metal bottles could also work. We prefer that plastic is not used for the sampling jars. |
| <b>Silicone sample bags</b>                       | <a href="#">Amazon</a>           | This is a great alternative for people traveling/flying/working in small boats! It replaces the glass jars (though you still need one sturdy container or glass or metal for the filtering).                                      |
| <b>Low shed sampling shirts: orange polyester</b> | <a href="#">Goex</a> (in orange) | White cotton shirts. Try NOT to have samplers in blue, red or black natural or synthetic materials.   |
| <b>Duct Tape</b>                                  | Any duct tape will do            | This is to cushion and label the jars. Other types of tape may work, but duct tape has proven to be waterproof and labelable.   |
| <b>Sharpie Marker: Fine Point</b>                 | <a href="#">Amazon</a>           | Any permanent, dark color that you can see on the duct tape. This is for labeling the tape on the jars. <a href="#">This model</a> has both the tips you need for this work (see analysis).                                       |

## Processing:

| Item  | Link to example                                  | Substitution options/limitations   |
|---|--|--|
| <b>Ceramic filter paper funnel/holder</b>             | <a href="#">Amazon</a>                           | It must fit your filter papers. Substitutions here are tough but could be jury-rigged.   |
| <b>Filter papers: Whatman, grade 1, 90mm, 10-15µm</b> | <a href="#">Sigma</a><br><a href="#">Aldrich</a> | In a pinch, you can use coffee filters (they are usually 20µm , but fibrous, which could interfere with analysis).   |
| <b>Clear glass slides</b>                             | <a href="#">Amscope</a>                          | No subs if using Easy Lift Tape, it must go on clear, glass slides.<br>If using J-Lar tape, then acetate or overhead-projector sheets or even white paper could work (see limitations of J-Lar below). Clear, glass slides are best, though.                                 |
| <b>*Easy Lift Tape</b>                                | Contact rzm                                      | J-Lar tape (see below):  |
| <b>Metal petri dish</b>                               | <a href="#">Amazon</a>                           | This serves several purposes: covers the ceramic funnel and can protect filter papers before or after taping. Other items can be used as long as they are not plastic and have a larger inner diameter than your filter papers.  |
| <b>Slide box</b>                                      | <a href="#">Sigma</a><br><a href="#">Aldrich</a> | Anything that will protect the slides from rubbing against each other and from breaking.   |
| <b>Squeeze bottle</b>                                 | <a href="#">Amazon</a>                           | Any bottle that will allow you to squeeze out a small stream of water for rinsing equipment will do, even if it is plastic as squeeze bottles are only made from plastic.  |
| <b>Tweezers</b>                                       | <a href="#">Amazon</a>                           | Most tweezers will do the job, this ends up personal preference.   |
| <b>*J-Lar Tape</b>                                    | <a href="#">Amazon</a>                           | See below discussion about tape.   |
| <b>Graduated cylinder</b>                             | <a href="#">Amazon</a>                           | If you are very vigilant about filling the glass jar to the top with no bubbles, then that jar's capacity can be the amount you record, and you can skip this. It is more formal, however, to measure the exact amount of water that was sampled (measured after filtering). |

## Analysis:

| Item  | Link to example                            | Substitution options/limitations  |
|---|--|---|
| Ability to magnify 400x                       | NA   | See notes below   |
| Ultra Fine point Sharpie                      | <a href="#">Amazon</a>                     | Other brands might work, key is non-smudging and a very fine point.   |
| Ability to take photos of magnified particles | A great example:<br><a href="#">LabCam</a> | Any digital camera that will capture the microparticle at the highest resolution possible: includes a phone down a microscope, digital microscope, etc. |

## Useful links:

Fun field data and processing sheets from Norrie Point:

Formal datasheet: Water only:

[https://docs.google.com/spreadsheets/d/1R6OtWpaHMM\\_ssojV-CkJyR3bScJUZ9Ie/edit?usp=sharing&oid=102115962455367873950&rtpof=true&sd=true](https://docs.google.com/spreadsheets/d/1R6OtWpaHMM_ssojV-CkJyR3bScJUZ9Ie/edit?usp=sharing&oid=102115962455367873950&rtpof=true&sd=true)

Visual guide for fiber shapes:

[https://docs.google.com/presentation/d/1o8lfNz6NMzy6vDlaO8KQLYDT21inrpGt\\_zH5W-l3fVM/edit?usp=sharing](https://docs.google.com/presentation/d/1o8lfNz6NMzy6vDlaO8KQLYDT21inrpGt_zH5W-l3fVM/edit?usp=sharing)

## Which tape to use? An assessment of the pros and cons.

**Easy Lift Tape:** this is the scientific standard and allows for potentially publishable results.

**Pros:** This is the ideal item to transfer microparticles from the filter paper to a glass slide. It will allow for full analyses of the particles, including the use of a polarizing light microscope to determine the likely material of fibers. Additionally, if an MP requires removing from the slide for analysis via spectroscopy or another means, that can easily be done using an adhesive remover and scalpel.

**Cons:** Primarily cost - at the writing of this list, the tapes are \$3 per tape (so \$3 per sample). Second, they must be obtained from the UK. Currently, that is a difficult process.

**J-Lar Tape:** This is a still-experimental alternative to Easy Lift Tape. It is extremely low-cost.

**Pros:** This tape is much less expensive and very easy to obtain (from Amazon, etc.). That makes it more forgiving for students to “mess up” without adding significant costs. It will still allow for high magnification and analysis via microscopy (determining 5/6 characteristics) as well as high-resolution photos to be used later (as part of an app that helps identify MPs collected using these methods).

**Cons:** The main limitation is that we will not be able to use it with a polarizing light microscope to identify material types of fibers. Additionally, we do not have scientific evidence of how effective it is in transferring microplastics from the filter paper to the glass slide (as we do with Easy Lift Tape). This means that results will show what is in the water, but calculations of concentration or total amounts will be much less reliable (and, until more is known, not publishable).

## Magnification

In order for participants to be able to get the most useful information from the samples and for the photos to be potentially useable for future applications, 400x magnification is necessary. More is useful but not required. This can be achieved by whatever microscope (compound, polarizing light, etc.) that you have access to. This can also be achieved using digital products such as digital microscopes that attach to a phone or computer.

That said, if this is more of a practice or educational exercise, do not let magnification levels stop you and do what you can with what you have - from student microscopes to the built-in iPhone camera zoom.

## Other:

- GPS or way to get a position: nearly every cell phone has a way to get a latitude/longitude, if you are on a vessel, you can get this info from the bridge. If you are on land, position can also be obtained after-sampling from Google Earth. Ideally, get it in decimal degrees. If you can't, then changing the units is easy in Excel.